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FARMERS DIGEST

FEBRUARY, 1942

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The Farmer's Digest

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The Farmer's Digest

Volume 5 February, 1942 Number 10

War and Agriculture

Condensed from Country Life

John R. Fleming

Bureau of Agricultural Economics

THIS war has been beer and skittles for agriculture so far. Prices are up, so are incomes. Makers of farm machinery have not yet begun to turn plowshares into swords. Some farm boys have been drafted, but only a handful in any given township. If farm labor in one spot is short, elsewhere there are still surplus thousands to draw upon. The verb "to sacrifice" seems to have only a future tense.

It may be that few farmers will agree with this rosy view of things as they are. Farmers have an occupational skepticism. A fellow has to get *used* to $10 hogs. But a year or two from now, most farmers will look back on 1941 as a comfortable year.

I am not thinking of a price collapse after 1941. That is hardly in the cards. The huge demand for most farm products will continue for at least another couple of years, even if peace suddenly and unexpectedly comes.

No, the reason farmers will look back on 1941 as a comfortable year is that they will appreciate it as a year in which farm prices increased faster than farm costs, a year in which labor shortages and seed shortages and delays in getting farm equipment and material were more talked about than felt.

You run out of almost everything in wartime. Prices go up, all right, and so do incomes, but still you run out of goods and services and the human energy which creates them.

We are consuming some 84,000,000 tons of iron and steel this year, and that is 50 per cent above 1937, a peak year; but we still aren't producing enough for wartime and peacetime needs both. So automobile production is to be cut in half, and refrigerators, and air-conditioning apparatus, and steel pipelines, and even that contemporary indispensable, the zipper.

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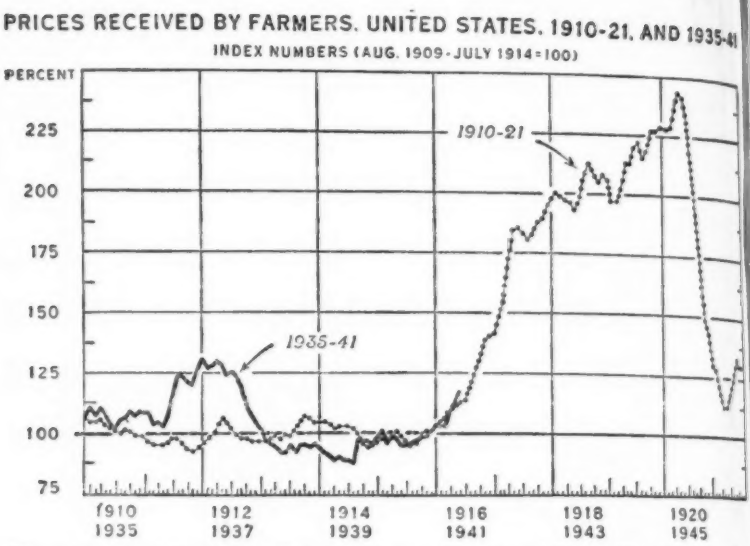

The price line of World War II is superimposed on that of World War I; so far they are almost identical—will they stay together from here on?

Copper is short and so is zinc (for fencing and roofing material) and nickel (for milking machines, for instance). Bags and packages for farm products will feel the pinch soon. Burlap from Indian jute is short, and the cotton substitute takes more processing capacity than we now have.

Certain kinds of wood and paper for packaging are no longer lying around loose. Shipments in bulk, buying and selling in bulk, will have to become more in vogue. Even the lowly feed bag, used to cushion the hard metal seat of many a mower, will acquire new and loftier value.

It is already becoming difficult to get the kind of paper you want when you want it.

It is not so much a shortage of paper as of the materials used in coating it. One ingredient of most coated papers, casein, has shot up in price to record levels because steel production has been vastly increased. Casein comes from milk. Two non-food uses for casein, aside from its use in plastics, are for coating paper and for making certain kinds of glue. In making steel coke is

burned. When coke is burned, a by-product is phenol, used in glues which compete with casein glue.

To increase steel production, it is necessary to use more coke, and to get more coke the ovens are operated at higher temperatures. The result is less phenol—and a greater demand for casein for glue. Since we normally have to import much of our casein, and since the demand for dried skim-milk for Britain has diverted so much of our normal domestic production, the price has gone through the roof.

Economic interdependence, the experts call it, and confusing, too.

The question is not so much what War with a Capital W does to agriculture, as what this particular war will do to it. Because most of us lived through World War I, we remember what happened to agriculture then, and we impose that pattern on World War II. The period 1914-18 becomes 1939-43, and the depression of 1921 becomes that of 1946, if not earlier and worse. Psychologically prepared for World War I, we expect World War II to conform.

This is not one man's opinion. It is the overwhelming conclusion of thousands of interviews by field men of the Department of Agriculture with farmers in every part of the country. The interviews have been analyzed by competent scientists with a care and thoroughness Dr. George Gallup might envy, and they point to this dominant attitude among farmers:

We are *uncertain* about the present, whether farm prices will stay relatively high, whether we can get help at harvest, etc., but we are *certain* that after the war we'll have a depression that will make 1932 look like prosperity.

Both the certainty and the uncertainty are rooted in experience, the experience of twenty years ago, unmodified by what has happened since.

World War I was something to remember, something for a farmer, as well as a soldier, to live through. Few farmers were psychologically prepared for what it did to agriculture.

The years before the war, on the whole, had been prosperous for farming. If exports of some products had begun to decline, it was a slow decline, and domestic consuming power was growing steadily.

For some time wheat had been selling close to a dollar, hogs above $7, butterfat above 25 cents, potatoes around 70 cents, apples above 90 cents. In a day when a farmer's fixed charges were relatively low, when his cash outlay for city goods and services was not large, when he grew much of his own living, those prices gave him what

seemed a reasonable equality with city folk.

There had been no prolonged economic depression since the Nineties. Land values, especially in the Middle West, had not within the memory of the oldest inhabitant done anything but go up. The oldest inhabitant in Iowa, for instance, might in 1914 have gathered his brood about him to recite that the average value of an acre of improved land in that State rose from $6.09 in 1850 to $11.91 in 1860, to $20.21 in 1870, to $43.31 in 1900, to $96 in 1910.

It is a fair guess that most farmers in 1914, or at least by 1917, expected prices and land values and incomes to go up and stay up. True, there were a few warning voices (Henry A. Wallace was one, in "Wallace's Farmer"), just as there were a few sour prophets for businessmen in 1929, but they were a small minority. There was, then, every reason to expand, go into debt, build castles in the air.

The wheat farmer got the fever first and probably worst. The Allies needed our wheat. Land in wheat averaged 48,000,000 acres before the war, spread out to 74,000,000 acres by 1919. The price went from below a dollar in 1914 to above $2 in 1917, so the Food Control Board slapped a ceiling on it.

Some of the wheat land had been in oats or barley or corn, but millions of acres of wheat were seeded in what until then had been virgin sod, precious grass in the semi-arid plains country more recently famous as the Dustbowl.

By the fall of 1916 corn prices started up, and by midsummer of 1917 had hit $1.75 a bushel. Corn acreage didn't change much, however, nor did cotton or tobacco. Regardless of acreage, prices went on up. Wheat poured across the sea, but cotton and tobacco stayed home. Still, prices went up, cotton to 25 cents or better.

As for livestock, hog prices sky-rocketed from $6 in 1915 to $15 by late 1917, and beef cattle went from $6.25 in 1914 to $9.50 in 1919, with the top stuff getting $17.50. Butter, of course, kept up with the procession, going from a farm price of 25 cents in 1914 to 54 cents in 1920. The poultry industry didn't do so well because of feed prices.

Horses and mules, curiously, even though 1,500,000 head were exported, brought little more than usual on the farm and felt no stimulus for bigger crops of colts.

Costs went up, too. Between 1914 and 1919 or 1920, agriculture's total bill for hired help more than doubled, as it almost did for fertilizer. Expenditures for autos, trucks, and tractors

trebled. By 1921, the taxes paid by farmers were about 2½ times what they were in 1914, interest payments on mortgages were double, and, in the Northeast, so were freight rates.

But up to 1920, you could still subtract costs from receipts and report some income—more income, in fact, than agriculture has been able to report before or since. From a gross income of about $7,000,000,000 in 1914, it went to 17 billion in 1919. (Gross farm income for 1941 will probably be about 12.5 billion. In 1932 it was down to 6.4 billion.)

So, between 1914 and 1920, farm land values went up 70 per cent on the average (in Iowa, where the law of averages was repealed, land went from $96 in 1910 to $255 in 1920), and gross cash rent per acre nearly doubled.

This was pleasant, but not out of line with the increase in earnings and values in the city. While the annual earnings of the average farmer were increasing from $320 to $590, between 1914 and 1918, the earnings of the average industrial worker were stepping from $675 to $1,095.

As the demand for farm production increased, and as prices jumped, the farm labor supply began to dwindle, lured by high wages in defense plants. The net migration from country to city by 1918 reached the sensational mark of 1,350,000 persons. Some, of course, went into the military services.

For the war period as a whole, 1,100,000 rural boys entered the armed services. That was roughly a fourth of the total enlisted or drafted. Other farm boys and girls, and often their parents as well, went to the city.

They came from the East, the Midwest, and the South, especially. Among them were no less than 300,000 Negroes, swelling Detroit's Negro population by 600 per cent, not to mention Cleveland and Chicago and Harlem.

Tenants moved about a good bit, in such times, for it was a renter's and a laborer's market, for a change. Country schools shortened their sessions, to help with the farm work.

Then came armistice, demobilization, back to the land, contraction of exports and of credit, and the price collapse of 1921, precursor and harbinger of long, hard years for agriculture.

That is the way it happened last time. Every farmer over 40 remembers it, and the younger ones have heard about it often enough. What is to prevent history repeating itself?

Let the question dangle a moment, and assume that history will repeat itself, year for year. Before me as I write is a simple chart showing prices received by farmers. On the chart are two

lines. One traces the course of farm prices from 1914 to 1921. The other line traces the course of farm prices from 1939 on, but, of course, stops in 1941.

The price line for World War II is placed on top of and parallel with the price line for World War I. From 1914 and 1939 on, the two lines are almost identical twins. Both in the first two years of the two wars, go up about 20 points. Question: Will they stay together from here on?

If they do, we should look for a sharp rise of more than 100 points or almost double the present price level, by the summer of 1944. And if history repeated itself in detail, year by year, we should see farm costs following, a little behind, gross and net farm income almost doubling by 1944; land values up 70 per cent, feed and fertilizer expenditures about double; expenditures for farm equipment trebling; net migration of nearly 1,500,000 souls from country to city in 1943 (the hypothetical 1918 of World War II); tenants hard to find and harder to keep.

The 1921 of World War II, according to schedule, should be 1946. If the fears of the more fatalistic farmers are to be realized, however, this year would be no mere 1921. They speak of it as a merger of the worst features of 1921 and 1932. The description can rest at that.

I suppose history can repeat itself, at least in broad outline. Certainly the shape of agriculture, and of the world, will be different after this war. Doubtless the shape of things to come will be different for different producing areas and commodities, as it will for different industries. Any war, all wars, will compel sudden, painful adjustments, during the war and after it.

But it is possible to argue, and there is evidence to support the argument, that World War II need not and probably will not do to agriculture what World War I did to it. It will take more than the memory of what happened twenty-odd years ago, to call forth the identical pattern and sequence of events.

The truth is, farmers' memories of 1921 are operating to prevent a repetition. Demand is pulling some farm prices up, yes, but farmers are not reacting to price increases as they did once before. They are expanding production, and are being asked by the Government to expand production largely by increased efficiency rather than by expansion of plant and debt.

Physically, there are profound agricultural differences between the two periods. Our war exports this time go mainly to the United Kingdom, instead of to the United Kingdom and

much of the Continent. The call this time is not for wheat, but for livestock products, in the main.

We began this war with many farm surpluses, rather than shortages, and if we have not learned to love surpluses, we have at least begun to learn how to live with them.

If our present surpluses of wheat and cotton disappear two or three years hence, the wheat and cotton growers and the Federal Government could inure themselves to that change, too.

But if the surpluses of wheat and cotton don't miraculously melt away, and if in time surpluses of other things accumulate, we have had some experience in recent years to permit us to face that uncomfortable fact, too, and without too much wailing and weeping.

This is no argument that the farm programs of the past eight or nine years are any final answer to the farm problem, or to the impact of war on agriculture. It is an argument that the farm programs have demonstrated that farmers can use the power of government to avoid the full pain of depression and to speed adjustments which have somehow or other to be made.

The details of these farm programs, and the controversy inherent in them, are outside the scope of this article. The essential fact is that agriculture has learned to use the power of government to protect itself from complete collapse, and has the political power and wisdom, one would guess, to continue the application.

Combine this governmental experience and power with a profound awareness of what happened in World War I, and it seems at least a reasonable chance that history will not be permitted to repeat itself. Among some farmers, if not a majority, the suspicion seems to be dawning that economic depressions are the work of man, aided and abetted by that collective creation of man known as government.

If that is so, if a depression is not simply an exercise in black magic, there may be some hope for the future. If it is production, and not money, that makes the world go, as war demonstrates to the hilt, the idea may this time take hold that production of goods and services had better be continued after the war.

George Washington—Farmer

From Kentucky Farmer's Home Journal

Vincent Crowdus

HOW much more delightful to an undebauched mind is the task of making improvements on the earth, than all the vain glory on the earth, acquired from ravaging it by the most uninterrupted career of conquest."

This is the sentiment expressed by George Washington, the Father of Our Country, whose birthday the nation celebrates this month.

Rightfully, and perhaps preferably to him, Washington could be called, as his granddaughter, Nellie Custis, once called him, "Farmer Washington."

In a letter to a Mrs. Wolcott shortly after the termination of Washington's official life and his return to Mount Vernon, Miss Custis wrote, "Grandpa is very well and much pleased with being once more Farmer Washington."

And Farmer Washington he was every moment that he was not a surveyor, soldier, or statesman. Furthermore, he was a scientific farmer, far in advance of his colonial contemporaries. He realized that science must lay a foundation for the art of agriculture, and he proceeded on that theory, experimenting in seed and soil improvements, crop rotations, fertilizers and stock breeding.

Washington bemoaned the poor Virginia farm system of that time in the following description:

"There is, perhaps, scarcely any part of America where farming has been less attended to than in this state. The cultivation of tobacco has been almost the sole object with men of landed property, and consequently a regular course of crops has never been in view. The general custom has been first to raise a crop of Indian corn (maize) which, according to the mode of cultivation, is a good preparation for wheat; then a crop of wheat; after which the ground is respited (except from weeds, and every trash that can contribute to its foulness) for about eighteen months; and so on, alternately, without any dressing, till the land is exhausted; then it is turned out, without being sown with grain seeds, or any method being taken to restore it; and another piece is ruined in the same

Reprinted by permission from the Kentucky Farmer's Home Journal, Louisville, Ky.

manner. No more cattle is raised than can be supported by low-land meadows, swamps, etc.; and the tops and blades of Indian corn; as few persons have attended to sowing grasses, and connecting cattle with their crops; the Indian corn is the chief support of the laborers and horses. Our lands . . . were originally very good; but use, and abuse, have made them quite otherwise."

To remedy this evil Washington set up a six-year rotation system for his 8,000-acre Mount Vernon estate. Briefly the plan was (1) corn with potatoes or some root crop; (2) wheat, rye, or winter barley; (3) buckwheat, peas, or other vegetables; (4) oats or summer barley, with clover; (5) clover of preceding year to remain for cutting, and (6) pasture and idle land in preparation for same round of crops again.

Although tobacco was the principal crop of colonial Virginia, being the medium of exchange, Washington made no provisions for it in his rotation plan. On the contrary, he wrote: "Except at a plantation or two upon York River, I make no more of that article than barely serves to furnish me with goods."

He was continually experimenting with new seeds or endeavoring to improve his plants. From his scrupulous notes and diaries one learns of some of his experiments. On December 4, 1788, he recorded that he "planted a large quantity of potatoes, and am more and more convinced of the prodigious usefulness of this root, and that it is very little, if anything, of an exhauster. I have a high opinion also of carrots."

Many foreign seeds were tried out on Washington's lands. He was continually in correspondence with English agricultural experts.

One of his many experiments with fertilizers is also found recorded in his diary, "Where, how, and with whom my time is Spent," for April 14, 1760:

"Mix'd my compost in a box with ten compartments, in the following manner, viz: in No. 1 is three pecks of the earth brought from below the hill out of the 46-acre field without any mixture; in No. 2 is two pecks of the same earth and one of marle taken out of the said field, which marle seem'd a little inclinable to sand.

3. Has 2 pecks of said earth, and one of riverside sand.
4. Has a peck of horse dung.
5. Has mud taken out of the creek.
6. Has cow dung.
7. Marle from the gullies on the hillside which seem'd to be purer than the other.
8. Sheep dung.

9. Black mould taken out of the Pocoson on the creek side.
10. Clay, got just below the garden.

All mix'd with the same quantity and sort of earth in the most effectual manner by reducing the whole to a tolerable degree of fineness and jabling them well together in a cloth.

In each of these divisions were planted 3 grains of wheat, 3 of oats, and as many of barley—all at equal distance in rows, and of equal depth (done by a machine made for the purpose).

The wheat rows are next the numbered side, the oats in the middle, and the barley on the side next the upper part of the garden.

Two or three hours after sowing in this manner and about one hour before Sunset I water'd them all equally alike with water that had been standing in a tub about two hours exposed to the Sun."

Owner and breeder of select breeds of plow and draft horses, stallions, oxen, beef cattle, and sheep, Washington was also one of the first breeders of mules in America. His stock included gifts of jacks and jennies from Lafayette and the king of Spain.

He elaborately recorded in his diary "so persuaded am I of the practicability and advantage of it (sheep raising) that I have raised near 200 lambs upon my farms this year."

His experiments even extended to cattle feeding methods "that a judgment may be formed of the best, and the least expensive mode of stall feeding beef for market, or for my own use."

And Farmer Washington believed in the modern methods of intensive farming. He was convinced "that if we were to reduce our cultivation . . . to half the present quantity, and manure and till that half well, our profits would be greater."

Productive Figures

Condensed from Capper's Farmer

M. B. Nelson

BEEF making had been a tradition on the C. F. Shaffer farm for many years. It was an approved enterprise of good farming. So nobody questioned its profit producing facilities, not even Carl T. Anderson when he became 50-50 operator of the place 27 years ago. Beef making was accepted at its face value.

And it was a sound practice on the Shaffer farm during the owner's operation and the early years of the 50-50 agreement. Steers were roughed through the winter to be fed out beginning in spring. It was a safe, non-speculative program.

Records are necessary in an owner-operator setup and strict account of all operations have been kept since the beginning of the 50-50 agreement on that Washington county, Iowa farm. But in 1923, close study of the partnership accounts were undertaken in a co-operative venture with Iowa State College. That afforded comparison of income production among the various projects under way not only on that farm but on other farms where similar accounting systems were in effect.

Something had happened in market and production cost relationships which hadn't been observed in the absence of searching comparisons. Projects which were assumed to be profitable didn't show up as well as some others. A change of emphasis was indicated.

"We discovered from those figures that it no longer paid to feed cattle for the sake of that operation alone," said Mr. Anderson. "Accordingly, we changed our method of beef making somewhat and reduced the number of cattle handled. If a man must get justification for beef making from the manure produced, he had better get the most manure possible from the fewest number of cattle. We now feed only two carloads, shut them in the barn early in the fall, carry them on legume hay, silage, and cottonseed meal until February and then begin full feeding for an August market. Only a small lot is used. We get as much manure from the two carloads as we formerly got from eight.

Reprinted by permission from Capper's Farmer, Topeka, Kansas

"Our records further show that manure builds land and we produce enough to treat 40 acres annually. That, together with the opportunity afforded for utilizing certain roughages, is our justification for keeping cattle."

About the time the college accounting system was established, Shaffer and Anderson bought 10 registered ewes. As a matter of course their record came into comparison with that of the cattle. Total income at first was small, but the showing was so good that increase was clearly justified. The flock grew by addition of ewe lambs until it began to challenge, through comparison, the wisdom of utilizing pasturage with cattle.

"We learned that sheep would pay a better price for grass," Mr. Anderson said, "and now the 160 to 200 ewes take much of the output from 100 acres. Lambs are dropped about March 1 and we like to have legume pasture for them, usually alfalfa. Ewes get a ration of grain from lambing until pasture is ready, but we offer none to the lambs.

"Succulent, fresh, rapidly growing pasturage is desirable for good lamb gains and so we get on to the alfalfa early, by the first or second week in April, and they grow up with it. A little hay is fed until they get so they won't eat it. Pasturage with mothers' milk finish them at 70 to 90 pounds by June 15 to July 15."

This method of making lamb is identical with the one worked out at Purdue University and practiced by an increasing number of Indiana flock owners. It is the practice followed by junior farmers in finishing lambs for the Indianapolis show every spring. From 30 to 40 ewes are replaced annually so the flock is renewed every 5 years.

Those same records which weighed cattle and sheep enterprises also brought hogs into comparison. Here the partnership discovered the best utilization of corn. The increase suggested by the records was made gradually until in early depression years the farm was turning out 1,100 annually. The combined spring, 360, and fall, 530, marketings recently was shy of that maximum; but in view of drouth, reduced feed supplies and none too eager markets the total illustrates emphasis which is placed on this phase of the farm's livestock operations.

With 80 to 100 acres available for pasture there is no want of clean ground. Other sanitation practices include precautionary cleaning of sows and disinfecting their quarters. For spring farrow there are six 3-sow colony portable farrowing houses which are hauled into a 60-foot shed at the barn. Sows, bred in lots of 18,

farrow under this double protection. When pigs are two weeks old they are moved out to clean pasture with their dams and the next lot of sows due replace them. Usually there are 3 farrowings and these are kept separated by temporary partition fences.

Fall litters are farrowed in the field and customarily on the alfalfa which was earlier used that season for lambs. If they don't keep growth down it may be clipped for hay to freshen the pasture. Shaffer and Anderson like to have a cornfield nearby so that litters and their mothers may run to it, at least until pigs are big enough or learn to ride down the stalks.

"Labor is one of the big factors in our operations," said Mr. Anderson, "so we resort to hogging down corn—up to 100 acres annually. As the various farrowing lots, pigs of different ages, advance they are removed from the fields and brought to the farmstead for final finishing. The first litters go into the barn about January 1, another February 15, and so on. We usually wind up fall pig marketing in April.

"After fattening hogs are removed from the cornfield, we turn sows in to get what grain may be left. It makes an excellent place for carrying brood sows, inasmuch as their search for feed gives them the desired exercise during pregnancy. One year we turned pigs into a field October 15 and there were still hogs in it when we were ready to sow small grain next spring."

To the original 280 acres Mr. Shaffer added another farm of 120. Later, when further expansion seemed desirable, the partnership bought a quarter section.

"Land holdings were increased as a matter of efficiency in employing labor, equipment, and management," Mr. Anderson explained. "Certain minimum equipment is required on any farm. Our records indicated that the smaller acreage was not employing what implements we had to the fullest degree and suggested that beyond the land itself but little additional investment in machinery would make all of our equipment as well as our labor more efficient. As a measure of that we have 96 crop acres per man. Records indicate our livestock value increase per man last year was nearly twice that of the average on 14 other farms, and our gross income a man was better than 60 percent higher than the average of the same 14 farms.

"Timeliness is quite as important a factor as labor saving in use of equipment altho it is not always possible to separate them for comparison. Mechanical power is largely responsible for advantages of both. Perhaps the field ensilage cutter illustrates

that as well as any equipment we have on the place. We own a fourth interest in the machine, and silo filling is now accomplished with a crew of eight whereas we formerly required 12 or 14 men. Ensiling proceeds at the best stage of corn and we make a better quality feed because there is no drying of the crop and no damage from muddied bundles following rain."

In hauling silage they use two basket racks, each with a trap door in the center of the floor. A drag line dump, originally of wagon box size, was widened, set into the ground at the silo, and connected with the blower. A framework of telephone poles and bridge plank protect the drag so that wagons can be driven over it. A lever opens the trap door in the bottom of the racks and the cut ensilage feeds down. Shoveling is avoided and unloading requires only about 10 minutes. A triple box load can be run out in 7 or 8 minutes.

Wagons are hauled with small tractors. If the field is so distant that 3 are needed, the third one is left to be loaded or unloaded while the tractors are on the road with the others.

The same effort to make profitable use of implements is extended also to building equipment. To the same barn where colony houses are hauled for spring farrowing is attached another 60-foot shed, on the opposite side, where fattening cattle are quartered. Other parts of the barn, one of the old commodious types, particularly portions of the hay mow, reached by a driven ramp from an embankment, are used for lambing.

The livestock program dictates in a measure the cropping system although comparative yields and returns from fields have been subjected separately to the record inspired scrutiny. Alfalfa was revealed as a high profit crop in the early years of accounting and all the land was limed to insure a stand. It is now produced in a short rotation with corn and barley. Although the seeding expense is high, short duration of stands avoids many of the difficulties which other farmers have with the crop. They use it just as they would red clover or mixed rotation seedings. Fields near the farmstead where manure may be conveniently spread may produce 2 or 3 crops of corn in succession but elsewhere the 1 year rule holds.

George Washington Carver Brings Millions from Nuts to Southland

Condensed from People and Places—DeSoto's Magazine

A horse trade is directly responsible for the Southland's new agricultural hopes. Swapping a $300 mare for a six-weeks old colored boy—who was to become the outstanding educator and scientist of his race — has brought Southern farmers millions in new wealth from the lowly peanut and sweet potato.

The story goes back to 1864 when Moses Carver, a white farmer from near Diamond Grove, Missouri, chased a group of night raiders into Arkansas and ransomed the child, son of one of his slaves. The mother, carried off by another band, was never heard from again, but the youngster lived to bring fame to the name of his rescuer. Today as George Washington Carver, he is known throughout the world for his research and astonishing series of experiments, especially with peanuts, from which he developed nearly 300 substances, including milk, butter, cheese, coffee, pickles, shaving lotion, breakfast food, flour, soap, ink and cosmetics. From sweet potatoes he produced 118 items, including starch, vinegar, shoeblacking, library paste and candy. He also developed dyes from clay, dandelions, onions, beans, tomato vines and trees. One of his dyes is believed to be a rediscovery of a lost purple used by the Egyptians. He has made paints from clay, peanuts and cattle manure with which he painted pictures, some of which hang in art galleries. From wood shavings he has made synthetic marble. Peanuts, however, are his prime interest.

Carver left his home in Missouri when he was ten years old. Eventually he made his way to Minneapolis, Kansas, where he finished high school. Later he worked his way through Iowa State University, where he received his BS in agriculture in 1894 and his MS in 1896. He was elected to a place on Iowa's faculty and after two years accepted the post offered him by the late Booker T. Washington, at Tuskegee Institute, where he is still a revered member of the faculty and he has been awarded degrees and doctorates by several universities.

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Crop Insurance Dollars

D. R. Mackenzie

BUSINESS was brisk in the general store of a small town in the midwestern wheat country early this fall. A traveling salesman, awaiting a lull in trade so he could talk business with the owner, recalled the generally good wheat crop in this state, then mentally compared it to the damaged and barren wheat fields in this and nearby counties through which he had just driven.

Later he learned why business was brisk in this community, whose farmers relied entirely upon wheat for cash income. It was because most of the farmers in that area had purchased all-risk wheat crop insurance. And this insurance, obtained from the Federal Crop Insurance Corporation, an agency of the United States Department of Agriculture, had supplied them some wheat income; wheat income they otherwise would not have had because unavoidable hazards beyond their control had destroyed their wheat.

More than a million wheat insurance contracts have been written by the Federal Crop Insurance Corporation in the last four years. And each year wheat growers everywhere have experienced the protection and benefits available to them under crop insurance. There is Carl Johnson, of Kanona, Kan., for example, who harvested only 300 bushels of wheat from 300 acres.

"If it had not been for crop insurance, I would have had to put a mortgage on my farm," says Mr. Johnson. He received 1,920 bushels of wheat as an indemnity under his insurance contract.

But Johnson, and other farmers who insured their wheat crops, paid for their insurance. They paid premiums based on crop loss experience of their farms for past years, making their payments to the Corporation in either actual wheat or the cash equivalent. In return they were guaranteed either 50 percent or 75 percent of their average yield, whichever coverage they selected.

As a result, crop insurance, the latest farm buoy for American farmers, has revived hope in the Dust Bowl, bolstered confidence in those tricky farming regions of the Southwest, and strengthened the security of the Northwest.

Wheat, a prime food necessity, always has been an uncertain

grain to raise. Waves of disaster have engulfed the crop at the most unexpected times. So farmers gambled on the future. They seeded their wheat and hoped for the best. They had to because no one can foretell the future. And if they could, there isn't much a farmer can do about drought, hail, rust, floods, fire, winterkill, insects, and plant disease. Generally, they either make a crop or lose a crop.

Benjamin Franklin once said: "It must have been a terrible tempest that devastated such an extent of country. I have sometimes thought that it might be well to establish an office of insurance for farms against the damage that may occur to them from storms, blight, insects, etc. A small sum paid by a number would repair such losses and prevent much poverty and distress."

That was written in 1788. But it wasn't until 1938 that such a plan was finally evolved. In that year the Federal government authorized the all-risk crop insurance program for wheat. Congress created the Federal Crop Insurance Corporation, authorizing a capital stock of $100,000,000 subscribed by the Treasury of the United States of America. The Corporation would insure yield only—not price—since several private companies had undertaken to write crop insurance and had failed because they had underwritten prices as well as yields. To avoid the danger of loss through price fluctuations, all calculations of the Corporation would be figured in terms of wheat. The Federal government would pay the cost of administration, but the program was to be non-profit so that over a period of years premiums collected and indemnities paid out would balance.

This made available to wheat growers the same type of protection that virtually all other lines of business have had access to for years—insurance. Although movie actresses had been able to insure their beauty; musicians their fingers; promoters their outdoor sports events against adverse weather; business and industry their investments, stocks, and real estate; never before had the wheat grower been able to obtain all-risk insurance on growing wheat—his first and last source of income.

To obtain crop insurance, there were, and are, certain requirements the farmer must meet. He must plant good seed, do a good job of farming, and care for his crop in a workmanlike manner. If he does that the Federal Crop Insurance Corporation will insure his crop for 50 percent or 75 percent of his average yield. His average yield is figured on the basis of crop production in past years just as

the amount of the premium he must pay is based on his farm's crop losses in past years. The grower also must insure all farms in the county in which he has an interest in the crop. If he grows winter wheat, he must sign his contract before August 30. If he seeds spring wheat, he must sign his contract not later than February 28. As an additional requirement, the contract must be signed before the crop is planted for the insurance becomes effective when the seed goes into the soil. With crop insurance, the farmer is protected against loss from all unavoidable hazards.

Originally, farmers paid their premiums in either actual wheat or the cash equivalent. Wheat premiums were stored by the Corporation against the day when they were needed to pay indemnities to farmers who suffered crop losses. When premiums were paid in the cash equivalent, the money was converted into wheat, which was stored. The Corporation was, and is, prevented by law from disposing of its wheat reserves except to use them for payment of indemnities. In the event stored wheat must be sold to prevent loss from deterioration, it must be replaced immediately. In 1941, however, an improvement was made in the method of paying premiums in that a commodity note was incorporated into the insurance application. This note stipulates the farmer must pay his premium on or before the date of maturity in either wheat or the cash equivalent. If the note is unpaid when it is due, the amount of the premium is deducted from the indemnity due him, if any, or may be deducted from the first government payment due him for participating in the national farm program. The dates of maturity for these commodity notes vary from state to state. Generally, the maturity date is set at about the time indemnities usually are paid in each state or about harvest time. Although this is a deferred payment plan, under which the farmer can select his own time in which to pay his premium, no interest is charged on these notes.

When the program first was started, indemnities also were paid in either actual wheat or the cash equivalent. Now a certificate of indemnity plan has been developed by which the farmer suffering a crop loss receives a certificate of indemnity. He can exchange this certificate for either cash or the commodity, if it is available, or he can turn it over to the Commodity Credit Corporation and obtain a wheat loan on the amount of wheat represented by the note if loans are available and the farmer is an Agricultural Adjustment Administration co-operator.

Up to now, all contracts, which terminate not later than October 30 unless an extension is authorized by the Corporation, have been for one crop year. Consideration now is being given to a term contract plan under which the farmer would insure for more than one year.

Field administration of the program, involving the writing of contracts, inspection of fields, and adjustment of losses, is handled by the community committeemen, and county and state committees of the Agricultural Adjustment Administration. Total losses are paid promptly. When partial losses occur, the farmer is indemnified to the extent of the difference between what he was guaranteed under his contract and the amount of wheat he harvested.

From a first year's business of 165,781 contracts, the Corporation this year has increased its volume to 437,633 insured farms as of October 15. Most of these farms are in the winter wheat area and, with completion of spring wheat business on February 28, 1942, it is expected the total insured farms will equal or exceed half a million for the 1942 crop year. Altogether 11,212,543 acres have been insured, under which the growers have been guaranteed a 1942 production of 127,004,848 bushels of wheat as of October 15, last.

During these first years of operation, indemnities have exceeded premiums collected. Over a period of years, however, premiums collected and indemnities paid out will about balance since on an actuarial basis, new crop production and crop loss records are being blended into the rate structure to reflect degree of risks and yields. These indemnities, however, have proven a boon to insured farmers in crop loss years. They have supplied wheat income when it was needed most —when the crop failed.

But insurance has benefited more than farmers. It has aided local business, too. It has meant a continuing purchasing power at the lumber yard, the implement house, seed and feed dealer, general store, and for professional services.

Insurance has made it possible for many farmers to avoid relief. It has also enabled others to avoid too burdensome debts, helped pay taxes, interest, meet mortgage payments, and purchase adequate food and clothing for their families. Next year, too, this same protection will be available to cotton growers. The same insurance principles will be applied to the 1942 cotton crop as to wheat with, it is expected, the same benefits to the millions of individuals dependent upon cotton for a living.

Planning the Pasture System

From the Book, "Farm Management"

Robert R. Hudelson

THERE are enough differences between pasture and harvested crops to justify separate consideration from a management point of view. Pasture feeding escapes harvesting costs and usually does not require annual seeding. It therefore constitutes a relatively cheap method of feeding. Pasture must be used where it is grown and hence can be sold only by supplying livestock to consume it or by renting the pasture to someone else. Pasture feeding is limited to the season in which weather conditions are favorable to grazing. This limits its use over most of the United States to the growing season, with some extension into the fall and winter for grazing dried grasses and crop residues.

Only a few favored regions can rely upon grazing the year around. Consequently pasture farming nearly always calls for a balance between pasture and harvested crops. The balance may be accomplished on the individual farm, within the community, or over wider areas. The ideal condition is to balance the individual farm so that enough pasture is available to take care of all grazing animals during the grazing season, with harvested feeds sufficient to winter and fatten all livestock grown. Such a plan avoids the costs involved in taking livestock to rented pasture, buying and hauling purchased feed to the farm, selling unfinished livestock, or shipping in livestock to consume surplus feed.

The ideal balance between pasture and harvested crops on the same farm is not often attainable. Many farms have a surplus of land suitable only for pasture. This may be rolling land which erodes seriously if planted to cultivated crops. It may be droughty land, due to surface sand or gravel, or to shallow, impervious subsoil, which limits the penetration of deep-rooted crops. It may be simply thin infertile soil, which will not give crop yields sufficient to pay for the labor and other costs of planning and harvesting crops. It may be poorly drained land which is too wet for cultivation, or finally pasture may be the best use of the land

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because it is obstructed with trees, stumps, gullies, or rocks. In such cases crops and livestock should be selected that will, so far as conditions permit, give the desired balance.

Pastures Classified

Pastures may be classified as permanent and rotated. There are also the by-product pastures. These consist of aftermath and crop residue that, unless there is livestock to consume them, largely go to waste. For permanent pasture it is desirable to have selections of grasses and legumes different from those for pasture to be left only two or three years. More expense for seed and seedbed preparations is also justified if the seeding process is not to be repeated for a number of years.

Pastures Vary Widely in Carrying Capacity

The value of a pasture is measured by its carrying capacity—in other words, by the quantity and quality of the livestock products which it will produce. Pastures vary extremely in this respect, ranging all the way from a good sweet clover crop in the Corn Belt that during its flush season may outgrow the appetites of three or four mature cattle per acre to the dry-land pastures on some of the high plateaus of the west, where fifteen or twenty acres are needed to carry a single animal unit.

The value of an acre of pasture land and the amount of tax which it can carry likewise vary a great deal. While engaged in land appraisal work over five states, from Indiana on the east to Oklahoma and Nebraska on the west, the writer had ample opportunity to observe this fact. One of the obvious lessons of this experience was that livestock products from all these states and others must sell on the same markets at approximately the same prices, with due allowance made for differences in transportation costs. Yet in western Nebraska grazing land was held at $5 to $10 an acre, with taxes ranging from 5c to 10c an acre, while grazing land in Illinois and Indiana was often held at more than $100 an acre, with taxes between 50c and $1.

To justify this ratio of land value and taxes, Illinois and Indiana grazing land should produce $100 worth of beef on about one-tenth the area required in Nebraska. The common allowance of pasturage for each mature steer or cow in the Nebraska ranch country at that time was about eight acres. To compete on an even basis, Illinois and Indiana farmers conducting a grazing type of animal production would need to carry at least one mature steer or cow per acre. This is sometimes done; but rarely, if ever, is it accomplished on permanent pastures. Many

farm-account keepers in Illinois, when asked concerning the number of cattle and the acres of permanent pastures, reported figures showing three to four acres or even more for each cow or steer. Wiggans of Cornell University reports that New York pastures carry less than one cow to three acres. Such rates of production do not justify the values which farmers commonly place on their pasture land.

Adequate Grazing Without Overgrazing is a Problem in Management

The more common solution in the successful grazing and farming areas will be to improve the productivity of pasture lands and to manage these lands so that they yield a maximum net income over a period of years. This not only involves having sufficient grazing animals on hand during the pasture season but also suitable provisions for handling these animals during the seasons when grazing is reduced or stopped.

It is well known that pastures in humid climates are best if grazed evenly and adequately, so as to keep the grass young and eliminate the patches of tall, mature grass and weeds so common in midsummer. The practice of overgrazing, with resulting injury to the weakened plants, is naturally undesirable. Even and adequate grazing would be easy if moisture and temperature were even and growth uniform. In that case about the same number of animals would be needed throughout the season. Actually, however, the speed of pasture growth varies widely from the rapid rate of May and June, when moisture, temperature, and sunlight combine in favorable proportions, to the slow rate or complete stoppage of growth in hot, dry August. On the pasture alone, it is impossible, even with the best management, always to have just the right number and kinds of livestock to make maximum utilization of grass.

Practical plans to adjust livestock enterprises to these conditions can be made in either of two directions: (1) there may be just enough livestock to eat the pasture during its season of minimum growth, with the surplus of flush seasons left to fall down and cure on the ground; or (2) numbers of livestock sufficient to graze off the pasture in the flush season may be kept and additional pastures or soiling crops used to supplement the regular pasture in late summer.

Serious losses are encountered when livestock are fitted to the season of least growth because the mature grass has less protein and more indigestible fiber and after it ripens the process of leaching begins to dissolve out some of the soluble but nutritious

compounds. The leaching process is less important in rainless areas and seasons. Certain compensating factors are realized where grass grows large. The old growth tends to form a mulch, which preserves moisture and fertility and increases next season's growth. The larger grasses are able to increase their root systems and leaf areas so as to produce a larger total growth than when kept short by close, even grazing. These compensations, however, leave the balance in favor of moderately close, even grazing. Too close grazing is detrimental because it weakens the plants, restricting their blade and root growth to the point where less palatable grasses and weeds come in. In sandy or dry areas some blowing of the soil may result.

Fertilization of Pasture is Needed in Many Areas

Pasture fertilization, the twin principle to pasture rotation in the Hohenheim system, has less general application over much of the United States than does pasture rotation; but undoubtedly many farmers of this country would profit by returning to their pastures some of the plant food which has been removed in the years since the country was settled. Beginning in the more thickly settled areas, where good markets are available for dairy and meat products and where land values and taxes are high, fertilization of pastures should extend out to the areas where probable income from better pastures may fail to repay this extra cost. In other words, there are large areas of low-priced lands, with low taxes, located far from market, where it is better economy to graze larger areas per animal and save the cost of fertilization. This applies especially to dry-land areas, where the limiting factor is moisture and where usually there is already an abundant supply of the common mineral elements of fertility. It undoubtedly applies also to some humid areas which are not adapted to intensive grazing.

The advantages of fertilization are considerable, however, especially where the limiting factor is a single one, such as limestone, which often can be had from a nearby source at low cost.

More productive pastures make possible the concentration of livestock on smaller areas, with less fencing and with less labor to look after herds and flocks. The overhead cost for interest and taxes are also likely to be less per livestock unit, although this may not hold for areas of low priced, low-taxed land.

REVIEW

FARM MANAGEMENT by Robert R. Hudelson (The Macmillan Co. $1.80) is a good reference book both for the man who plans to buy a farm, and for the farmer who has operated a farm for many years. For the former it outlines a plan from which to work. For the latter, it holds up a standard for comparison. No business is perfectly operated. No matter how successful it may be, there is always room for improvement. This is especially true with the business of farming where conditions change, and where often the operator of the farm, is also the man who plans the work. Due to the fact that the work on a farm is never done, there is a tendency to neglect long range planning, in favor of a day to day planning. This does not produce the best results. Therefore all farmers would benefit by reading this well worked out book, and putting into effect such ideas as seem applicable to their particular business.

Low Cost Potato Storage

Condensed from Pennsylvania Farmer

J. B. R. Dickey

LAST November a dozen farmers gathered at the farm of Harry Weaver in Clearfield County, Penna., for a demonstration of pit storage of seed potatoes conducted by County Agent Mitchell and an agronomy specialist from State College. The day was too cold for comfort, being close to the freezing point, but just right for the job in hand, since potatoes should be pitted as close to the freezing point as it is safe to have them in order to keep cold and dormant through the winter and into the spring; otherwise they stay warm and soon start to sprout and heat.

A deadfurrow about four feet wide was plowed out on a sloping, well-drained spot near the barn. The loose dirt was cleared out with shovels to make a long pit about 10 inches deep. The potatoes were put in and piled up as high as possible without rolling out of the trench and a layer of straw about 10 to 12 inches thick spread evenly over them. This was covered with three inches of the soil shoveled and plowed from the pit. On top of this soil another layer of straw was spread at least a foot thick when settled. This layer was drawn out well at the bottom to keep the frost out at the

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ground line, and the whole thing covered with another six inches of soil, well patted down with the backs of the shovels. A few furrows run around the pit at a distance of six to eight feet furnished plenty of loose soil for the covering. No ventilators are needed in a long, narrow pit with well-ripened and cooled tubers.

All that was needed after that was occasional filling of cracks in the earth cover caused by settling of the straw. Straw is a fine insulation and if enough is used there is little danger of frost getting in. A single layer of straw and soil, if thick enough may serve but is seldom safe where winters are severe.

A week or more before planting time last spring another meeting was held to see how the potatoes looked when taken out. Some men came back pretty sure that they would find the potatoes frozen and rotten. When the soil and straw were removed the only damage was in one small spot where the cover had not been made quite thick enough. The tubers were as cold and firm as when put in, with the eyes barely started. The thick cover not only prevented freezing but later kept the potatoes cold, even after the weather was quite warm. This will effectively prevent sprouting sometimes until the middle of May.

To further test out the plan, Mr. Weaver planted some of the same seed, which had been stored in his cellar, alongside the pitted potatoes. A check on yield was made this fall at digging time. The pitted seed yielded at the rate of 286.7 bushels per acre, while the cellar stored seed made only 223.8 bushels, an increase of 63 bushels or 28 per cent in favor of pit-stored potatoes. It was also observed that there were less second growth and misshapen stuff from the pitted potatoes, probably due to better vigor.

Many farmers do not have a good cellar for potato storage, seed kept over comes out more or less sprouted, shrivelled and lacking in the vigor needed for maximum yields. The better crops often secured from northern grown seed may be due in part to the better condition in which this seed comes to us. Any one with proper care can keep seed or table stock in good condition by pitting.

Rebuilding a Worn-out Farm

Condensed from Better Crops With Plant Food

F. J. Hurst

Agricultural Adjustment Administration, Jackson, Mississippi

AGRICULTURE can be rebuilt. Old lands can be made new. Impoverished and depleted soils can be made fertile and productive. Crop yields and pasture production can be economically increased.

Seven years ago Robinwood Farm, eight miles north of Jackson, in Hinds County, Mississippi, was a run-down, worn-out, and abandoned farm. Years of one-crop farming and misuse of the land had left their tragic toll. Gullies marred a once fertile landscape, and eroded areas looked like great sore spots on once productive hillsides. Crop yields had declined. The last family had moved from the farm. There was not a house left on the land.

Robinwood Farm today has fertile fields, productive pastures, fine herds of cattle, miles of fences, attractive and comfortable houses, and contented families. Fertility has been restored, and production has been brought back. This transformation has been brought about by J. T. Brown, a banker of Jackson, who has a deep interest in agriculture, an abiding faith in farming, and a determination to render a distinctive service to his community and county.

For years Mr. Brown had attempted to interest his business associates in backing farm improvement programs. But for the most part his pleas fell on "unresponsive ears." He had long recognized that Mississippi was fundamentally an agricultural state and that if the commonwealth was to prosper, farming had to be made profitable.

When the agricultural depression in 1932, 1933, and 1934 began to bring economic ruin and financial disaster to business and agriculture alike, Mr. Brown realized that something had to be done to aid agriculture. It was then that he decided to buy a run-down farm to demonstrate that farming could be made to pay when scientific practices and sound farming methods are followed.

Terracing, production of winter cover crops and summer legumes, plowing under of green manure crops, application of

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limestone, and liberal use of phosphoric acid, potash, and all available barnyard manures, are practices which have been used to reclaim the entire farm and make every acre productive. That this soil-building formula has produced the right results is attested by the high crop yields harvested in 1941 when averages of 75 bushels of corn, 55 bushels of oats, 2½ tons of lespedeza, and 1 bale of cotton per acre were gathered.

The first step taken by Mr. Brown to conserve and restore soil fertility was the terracing of every acre of pasture and cropland on the farm. He realized that unless gullying and erosion on the steep hillsides and rolling lands were halted, much of his effort to improve soil fertility by growing legumes and applying fertilizers would be wasted. Washing rains would continue to sweep over these areas and carry off the topsoil and with it some of the fertilizers which had been applied on the fields. He promptly arranged for the use of a heavy tractor, bought a terracing level, secured other necessary equipment, started terracing, and never stopped until every acre had been terraced.

Commenting on the value of terracing, Mr. Brown says, "You can't conserve and improve soil on hill lands unless you control erosion. You must stabilize the soil. Terraces slow down run-off to a walk and give the water more time to sink into the soil. They help to save the more fertile topsoil and conserve moisture. With a good system of terraces and contour farming, you get not only the immediate benefits from growing and plowing under legumes and applying limestone and commercial fertilizers but also the long-time benefits from these practices because you reduce erosion and water run-off to a minimum."

Production of winter cover crops and summer legumes together with the application of limestone, phosphoric acid, and potash are rated by Mr. Brown as "must practices" in his soil-building, high-crop-yields program. Last winter he had 77 acres in hairy vetch and Austrian winter peas. These thick-growing, nitrogen-gathering crops trapped the rainfall, held the water on the land, prevented erosion, and when plowed under in the spring added nitrogen and humus to the soil.

In addition, 90 acres were seeded to oats, which furnished a protective cover for the land during the winter and yielded a grain crop in the spring. Of the 90 acres in oats, 64 were planted to lespedeza in February for hay in August and September. A liberal acreage in soybeans and crotalaria rounded out the legume-

cropping program, which included a total of 239 acres in soil-conserving, erosion-resisting, soil-building crops.

Although he had been using basic slag and potash on cover crops and a complete fertilizer under cotton with highly satisfactory results from the very beginning of his farming operations, in August, 1940, Mr. Brown decided to have soil tests made of every field on the farm to determine the deficiencies of plant-food elements in the soil and to serve as a guide in the fertilization of crops. This work has proved highly beneficial. "Soil testing is a key to soil building," says Mr. Brown. "It reveals what plant-food elements are lacking in the soil. It enables the farmer to make the most efficient use of fertilizers and helps him to produce maximum yields at minimum costs."

The tests showed that the soils on the farm were deficient in lime, phosphorus, and potash. So Mr. Brown immediately planned to apply optimum quantities of these materials under crops and on pastures. On one 40-acre field he applied 2 tons of limestone, a liberal application of phosphorus, and 400 pounds of muriate of potash per acre.

In October, 1940, this field was planted to hairy vetch and Austrian winter peas. In early April measured areas showed an estimated yield of 8.9 tons of vetch and 9.78 tons of peas per acre. The vetch and peas were plowed under about the middle of April and the land planted to hybrid corn on May 10.

This field, which had no fertilizer other than that applied under the cover crops, in the fall of 1941 produced an average of 75 bushels of corn per acre. Soil tests which were made after the corn was harvested showed liberal quantities of plant food still present in the soil for use of future crops.

Similar quantities of limestone, phosphate, and potash were applied on 64 acres of oats, which were seeded to lespedeza in February. This field yielded approximately 55 bushels of oats and 2½ tons of lespedeza per acre. And the oats and lespedeza provided a protective sod crop to prevent erosion on the land throughout the year. Cotton was fertilized with 4-8-4 at the rate of 300 pounds per acre. Land once considered too poor to cultivate yielded a bale of cotton per acre in 1941.

With livestock playing an important role on Robinwood Farm, around 150 acres of improved pasture already have been established for the 155 head of purebred and high-grade Hereford cattle on the farm. All improved pasture land is being fertilized with 2 tons of limestone,

a liberal application of phosphorus, and 400 pounds of muriate of potash per acre and seeded to dallis grass, hop clover, white Dutch clover, and lespedeza. Pastures are mowed regularly to control weeds, conserve moisture, and improve grazing. On a portion of the poor land put in pasture, a crop of crotalaria was first grown and plowed under to add organic matter and nitrogen to the soil.

Lespedeza hay, corn stover, blackstrap molasses and cottonseed meal—all farm-grown except the molasses—are feeds used in the winter feeding program for beef cattle. Shredded corn stover is sprinkled with blackstrap molasses and cottonseed meal is added. This together with lespedeza hay provides a feed that keeps the cattle in thrifty growing condition throughout the winter. Breeding cows go on pasture in the spring in better condition, drop a higher percentage of heavier calves, and produce more milk for their offspring. Purebred bulls of approved type are used and the choicest heifer calves are selected and developed to improve the cow herd.

An unusual system of farm marketing enables Mr. Brown to get the highest possible price for cattle and hogs. All animals are slaughtered, chilled, aged, stored, and sold over the counter on the farm during the fall and winter months. Rural electrical current at reasonable rates, a farm refrigeration unit, farm labor, and a farm-owned market make this practice possible and profitable. By this means Mr. Brown not only gets the farm price for his cattle and hogs but he pockets the difference between the farm price of cattle and hogs on foot and the price consumers pay for dressed cuts of beef and pork.

Robinwood Farm today is a mecca for farmers and agricultural leaders who come from far and near to see at first hand how an abandoned and worn-out farm has been reclaimed and made productive.

"To Mr. M. I. Robertson, farm manager, goes a lot of credit for the success of Robinwood Farm," says Mr. Brown.

Growing Winter Rhubarb

Condensed from The Michigan Farmer

Keith C. Barrons

Assistant Professor of Horticulture, Michigan State College

EVERY winter luscious fresh rhubarb makes its appearance. The long red stalks with their small yellowish leaves still attached make a particularly attractive display in the long green boxes in which most of the winter rhubarb is packed and shipped. This product is known as "forced rhubarb," and most of it is raised in Michigan, particularly in Macomb County. In fact, that area is the largest center of that specialized horticultural industry in the country and Michigan forced rhubarb may be found on most of the large city markets in the east and midwest. In some years the value of the crop to Michigan farmers has exceeded one-half million dollars. Some is grown in the pacific Northwest, some around Boston, and a few market gardeners here and there have tried their hand at raising this unusual product.

When forced on a commercial scale, the rhubarb roots are grown in the field for two years and then, after the tops die down in the fall, they are dug or plowed out and allowed to freeze. It is very important that the roots freeze before attempting to force them. Without this treatment their natural rest period will not be broken and growth will be slow and irregular. The roots are then placed side by side in the forcing house which consists of a long low shed covered with straw, sawdust, or manure for insulation being heated by means of a stove.

The temperature is kept at 50 to 60 degrees and within a few days after thawing out the first red "humps" appear where the rhubarb leaves will begin to push up a few days later. The roots are covered with a very small amount of soil, just enough to prevent drying out and water is applied as needed. As a rule, little is used because the clumps of roots and the adhering soil are moist when brought in and little evaporation takes place. The house is kept dark except when electric lights are needed while tending the stove or while harvesting. Because of the lack of light the leaf blade is very small and little green coloring matter develops. When the leaf stalks

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(botanically speaking, the part we eat is the petiole of the leaf) are about 15 to 18 inches long, they are pulled, graded according to diameter, and packed in long green boxes which hold 5 pounds. Pasteboard cartons holding 10 of these boxes are used for shipment, usually by express.

The commercial production of winter rhubarb is not suggested as a new enterprise without very careful consideration of production costs, prices and market conditions. A considerable investment is involved not only in the construction of a forcing shed but also in the cost of building up a stock of roots. To start in by buying the necessary roots might be too costly, and if only a few are obtained to begin with, it may take from 3 to 5 years to propagate the necessary number even for a small beginning. The business has been profitable to some growers in the past but not without its share of hard work and failures due to inexperience. Competition is now greater than ever and would-be beginners should consider all angles of the business carefully before attempting to break into it.

Growing rhubarb at home, however, is not difficult and is something everyone who has a garden can do. The quality of the product is equal to that sold in the stores and, as many do not have commercial rhubarb available, it adds considerable zest to our winter menus. If you have a basement or even an old-fashioned dirt-floor cellar, you can grow all you can eat at no cost and only a little work.

The first thing to do, of course, is to grow the roots in your garden. No doubt you will have more clumps now than you need so we will assume that you can use some this winter. Some of the others should be taken up early next spring and divided into several pieces. These root divisions should be reset in good soil and grown for two summers before forcing.

Now for the method of handling in the winter. Dig the clumps before the ground freezes up for the winter and merely place them right side up is some place where they will freeze. Try to keep as many of the fleshy roots intact as practicable for it is from these that the stalks get their food materials that enable them to grow. The clumps may be left right in the garden but it is really best to place them near the house on a layer of leaves or straw so they will not freeze to the ground. After a period of cold weather, during which they have been frozen at least once, bring the clumps into the basement and place them close together on the floor. If the floor is of concrete, it is a good plan to put down a 2- or 3-inch layer of moist soil, sand, or peat

underneath the roots. In any case, a thin layer of one of the above materials should be placed over the exposed portions of the roots but the entire space between the different clumps need not be filled up. New roots do not form to any extent during the forcing period and the purpose of the covering is merely to prevent drying out.

The best temperatures for forcing are between 50 and 60 degrees. Lower temperatures will do no harm, providing freezing does not occur, but will, of course, result in slower growth. Higher temperatures, however, will likely result in poor color and rather soft stalks.

It is not absolutely essential to exclude light as is practiced in the regular forcing houses, but some sort of a cover will do this and serve the added purpose of preventing rapid dehydration by the dry atmosphere of a basement where a furnace is located. A simple framework and any cast-off sheet or canvas will do the trick. The amount of watering necessary will vary with the dryness of the air and the temperature. Sprinkle the rhubarb occasionally, enough to keep the soil moist but not wet.

Growth will start within a few days and the first stalks will be a foot or more long and ready for pulling in about 4 to 5 weeks depending on the temperatures at which they are grown. When the leaf stalks reach a length of 15 inches they are not likely to elongate much further and should be pulled. Rhubarb can usually be pulled from the same roots over a period of a month or even more. In order to have a succession it is best to bring in a few roots at a time at intervals of a month until early in March. Each root will produce up to 5 pounds of edible stalks, depending on its size and vigor.

The commercial growers must use a variety that produces straight stalks that are well colored and have a large diameter. For home forcing one can use any variety he happens to have growing. The MacDonald variety is excellent for outdoor culture, and although it is not satisfactory for commercial forcing, it is quite all right for the amateur.

Chinchilla—New Fur for Farming

Condensed from The Western Farm Life

G. F. Bateman

IF you were told you could produce $80,000 annually in live stock on a piece of land 62 by 16 feet or a plot about one-fourth of a city lot you would, no doubt, be interested and perhaps justly skeptical. Yet this is precisely what a new industry born of the West offers a limited number of farmers.

Chinchilla fur ranching, as this new business is called, is truly a western industry and is most profitable if conducted in the West. This part of the country, it seems, offers the best in climate and altitude for the most successful breeding of the winsome little animal.

The chinchilla (Chinchilla lanigera) is native of the Andes mountains in Peru, Chile and Bolivia, South America. They resemble in some ways rabbits or rather hares and at the same time look somewhat like our bushy-tailed mountain pack rat.

They are not burrowing animals, in spite of old encyclopedia accounts of them. The fore paws are not in any way equipped for digging. However, in the wild state, they do use natural dens in loose rocks or the deserted burrows of other animals. The young are born completely furred over, the eyes are open, and while the babies weigh only 1½ to 2 ounces at birth, they can scamper away almost instantly. In fact breeders of the domesticated animals have to arrange barriers in the nest boxes to prevent the damp little fellows from getting out into the pen and catching cold before they dry.

The adults are extremely swift of motion, almost lightning-like; a flash of gray and they are gone. All these characteristics taken together indicate that their way of escaping natural enemies lies in the ability they have of quick motion, almost instant readiness for flight after birth, and their protective color.

But man is not a natural enemy. First the Chincha Indians, from whom the chinchilla gets its name, then the Incas followed by the Spaniard, and later the British all took proportionate toll of the chinchilla. While the Indian used only what he needed for fur robes and blankets, the Spaniard, with his Queen in mind, robbed the Indian. Later after making slaves of the na-

Reprinted by permission from Western Farm Life, Nov. 15, 1941, Denver, Colorado

tives, the Spaniards forced them to capture great quantities for export to the home land.

As the progress of history changed control of the Americas, the British, with profit in mind, trapped the chinchilla at the estimated rate of 1,000,000 annually, to near extinction. Finally in 1918 the three South American governments prohibited pelt exportation and outlawed trapping. It was in this year that a California mining engineer named M. F. Chapman, while in South America, became interested in the possibility of saving the chinchilla and domesticating them.

Chapman believed that these bearers of the world's most priceless fur could be raised in captivity. So with the help of some 20 Indians over 4 years of time he succeeded in taking alive three acceptable females and eight males. After much negotiating and pulling of political strings, these 11 animals were moved to Los Angeles, California, Chapman's home. These few wild creatures became the nucleus of the present herds which number 9,000 animals.

Domestication has proven a successful endeavor, but it took Chapman many years of effort and much money to establish his animals on a basis which could be adopted by other ranchers. Now there are some 60 ranches in the United States and Dominion of Canada with 1,200 owners of pairs. Of this number about 75 per cent of the ranches are located in the western and Rocky Mountain states.

It was found that foods raised by the majority of farmers could be fed successfully to chinchillas. And since the raising of these animals has shown a definite trend toward big business, one of the livestock feed companies has developed a balanced ration in pellet form which is now on the market. Green stuff such as fresh alfalfa, dandelion leaves, vegetable tops, and roots of carrot are relished. Cured hay is also a principal part of the diet. In the wild state chinchillas cured their hay from wild grass which was stored away for winter use.

Chinchillas are not hard to raise, but they require a lot of care. The cow pony, tractor plow, and reaper have no place on a chinchilla ranch. The rancher must be first of all interested in small stock and think in terms of small stock methods. A sack of pellets and a bale of hay constitute the feed requirements of 50 pair for several weeks and a tablespoon and a stiff broom take the place of the pitch fork and harrow.

So far in the development of domestic chinchillas no specific disease peculiar to chinchillas has appeared. They do, however, become affected by colds, pneu-

monia and a form of typhoid fever. All these ailments can be prevented in a large way through sanitary living conditions, proper food and care.

If an animal becomes sick and dies the carcass is immediately sent to the laboratory in California, where a test is made. From this test recommendations are made to the rancher for proper inoculation of the remainder of the herd. This work must be done by a veterinarian. Chinchillas are naturally healthy, contented animals. And if their house has been properly constructed and the pens correctly built, only routine cleaning and care will be necessary.

There is no one type of house or pen. The farmer's good judgment can be his guide. However, it is best to stay close to designs and plans that have proven efficient. A well built house with a good concrete floor that can be kept cool in summer and around 50 degrees in winter, one that is dry and readily cleaned, and with lots of sunshine coming in seems to cover the requirements. A building 16 by 62 feet with an 8-foot ceiling will accommodate 50 pairs of chinchillas.

The pens should be made of a strong wire fabric with mesh sufficiently large to permit litter and droppings to fall through to the concrete and at the same time small enough to allow the animals easy footing without catching their feet. This material can be had in the form of a welded wire fabric with mesh ½ inch by 2 inches. A pen 3 feet square by 2 feet high is large enough.

Nest boxes should be approximately a foot in all dimensions with provision for a false floor of wire cloth placed a few inches above a removable solid wood floor. These nest boxes are best if made of ply wood. The separation between the wire false floor and the solid one should be enough to permit a small wattage electric lamp being fastened to one side. This lamp is turned on only at the time the mother is to litter and left on until the babies are old enough to leave the box.

The chinchilla is naturally a clean animal and loves its bath. This ablution is taken in a medium sized pan of clean sand which is placed in the pen for a short time at nights. The chinchilla hops into this pan and cuddles down for a moment, then quicker than the eye can follow rolls completely over dusting the sand into its fur. This movement is so rapid and lightning-like that it takes a quick eye to even detect a movement.

What does all this housing and equipment cost? The house mentioned with pens for 50 pair costs $1,600 to build new. This makes a housing cost of approximately

$32 a pair. Feed is a minor item, $5.00 will buy food for a pair for a year. Labor of caring for the animals may or may not be a figurable expense. One man can care for 100 pair so the rancher can do this work himself and still have time for other duties.

Chinchillas cost the owner $3,200 a pair, a little over $1,000 a pound. But the average herd increase is 100 per cent annually. And with the plan worked out by a chinchilla company by which pools are formed, losses are not charged to the individual. The pool absorbs any loss due to death of a single animal or a pair and the owner still has his interest. Likewise the increase is prorated. On an average, a chinchilla will produce two offspring in a litter and two litters a year.

Seldom does a rancher own all the animals he cares for. The majority of the animals sold are to individual owners who have no adequate place to keep them, so the earmarked animals are turned over to an accredited ranch where they are kept until such time as the owner is equipped to care for them, if he wishes to do so. A board fee of $5.00 a month a pair is charged which gives the animals all the care they require.

The rancher gets this money and out of it he is bound to feed and doctor the animals. The rancher may not own any animals himself. However, he usually does as an expression of good faith and good business. With 50 pair of boarders, $5.00 each a month gives the rancher a gross income of $250 which is not so bad.

Another viewpoint to take is that this income is steady month in and month out, year in and year out. It is not dependent upon market condition, drouths, harvesting nor rainfall.

Before a rancher can be accredited, he must go to the large Chapman ranch in California and spend some time there learning the chinchilla business. This time is as important an investment for the rancher as are good buildings. Experience has proven that the men who have had this training have little trouble later, when they are actively engaged in chinchilla raising, while the ones without this education have trouble.

Chinchilla ranching may seem small scale business in one way. But like large truck scales weighing thousands of pounds balanced by a small weight on the end of the beam, the smallness of some items in chinchilla raising balances huge potentialities when one considers that $5.00 worth of food will ration $3,200 worth of live stock. Likewise that animals valued at $160,000 can be housed within a building 62 feet long by 16 feet wide.

Water Possibilities

Condensed from New England Homestead

George M. Foulkrod
University of New Hampshire

THE New England states are just passing through one of the driest seasons in history. This is especially true in certain rather broad areas in Massachusetts, southern New Hampshire and southern Maine. Springs that have never been known to fail in 40 or 50 years have dropped to the point where they must be supplemented from other sources. Every farmer and rural resident has been affected to some extent and many of the towns are worried.

A great many questions arise because lack of water supply depends entirely on natural phenomena over which we have no control. All we can do is to solve each case on its own individual merits. The federal and state agricultural agents and others have been doing all they could to help the farmers supplement their dwindling supply of water —but these men cannot reach everyone, so I am offering some of the simpler things that can be done for your consideration.

The many lakes and ponds scattered through the affected area offer a supplementary supply that is perhaps most easily developed.

A fairly large power pump, installed in an easily accessible place offers a means for the farmer to fill his containers with the minimum of effort and time. Many of the contractors and power companies are willing to loan or rent such pumps for emergency use.

The problem of transportation still remains the big item of expense and loss of time if the distance is great, and the tank wagons or other containers for hauling are hard to get.

To offset the long hauls many farmers have dug emergency wells in sloughs, drains or old stream beds where the grass is green even in dry weather or where intermittent springs occur. Holes 10 to 15 feet deep and four to five feet in diameter have been found to fill overnight, or at least to collect enough water to maintain livestock. The main objection to such wells is that surface water will drain into them and unless the water is boil-

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ed or otherwise treated it is unsafe for household use, just as that obtained from the lakes and ponds.

Tests for such shallow wells can be made with an ordinary post hole auger. By adding two or three feet of pipe at a time to the handle considerable depths can be reached, if rocks do not interfere. If the test hole does not collect water the farmer is not out much. If it does, he can curb it with drain tile or dig a larger well on the spot.

To Deepen Well

Dug wells are sometimes deepened in dry times by sinking in the bottom one or more lengths of drain tile or vitrified sewer pipe of as large a size as will go into the well. The tile should be settled by digging or scooping the material from within, care being taken not to undermine the old well curb or casing.

The top of the tile or pipe should be left six to eight inches above the bottom of the old curb. An auger or drive point should be used to search for water at the greater depth, and locate ledge rock before the work is begun or the results may be very disappointing.

If the bottom of your dug well is on a ledge you can get a contractor to drill in the bottom of the hole and thus save a few dollars per foot drilling cost. But unless the old well is in the ideal location with regard to the buildings, you will usually gain in the long run by having the new well drilled where you want it and keeping the old one as a supplementary supply.

Many men who have had gravity systems with a siphon over a small rise have had difficulty with the flow ceasing when water gets low, allowing an air pocket to break the action. This cannot be easily overcome but it can be easily started again after the water level has come up by having a small hand pump at the house. When the water stops flowing, allow time enough for it to build up in the spring or well. Then it can be started again by operating the hand pump long enough to fill the pipe up to and over the crest of the siphon, and thus clear the air pocket. After this the water will flow until the spring is again too low and air enters the pipe.

There are two advantages to sinking new wells in dry times. First, labor costs should be less; and second, any well that has plenty of water now should be an excellent well in normal years. No well should ever be regarded as complete or accepted on a contract until a pumping test of some duration has been made to determine its sufficiency for farm use. Make sure it has not tapped just a small pocket of water.

Some men have wells so deep

that they still contain water but the water is below the suction lift of the ordinary shallow well pump, especially when placed in the basement or kitchen.

The shallow well pumps with the injector in the well called by various trade names by their manufacturers are especially adapted to such conditions.

They can be installed in the house and will lift water (with the aid of the injector in the well and a second pipe to deliver water to it) at least twice as high as the best shallow well pump. If you have a well where the water falls rapidly in dry weather and the pump loses its "prime" often, this pump will solve your trouble.

Perhaps you would like to place your new pump higher above the water or some distance from the well to get it into a protected place, here again the injector pump has a distinct advantage.

It is, however, not a "cure all" and really has no advantage where the ordinary shallow well pump is entirely satisfactory. It will cost perhaps *one-third more* installed.

When it comes to sinking a new well which should be classed as a major investment (for it is a permanent part of the farm just as much as the barn or house or roads), it pays to consider all the possibilities carefully.

Get all the local information you can from your neighbors and local business men and contractors; check your local geological formations; contact your County Agent. The State Geologist and Health department and Highway department have some valuable information; and the United States Department of Agriculture has publications of value to you.

A new well for a good farm business should be given just as much consideration as any other major change in the business, for it certainly can make or break a profit, as many have discovered this season.

Breeding and Feeding Young Stock

Condensed from The Jersey Bulletin

C. B. Bender

THE future of the dairy business depends on the quality of the calves raised to replace worn-out cows. The first factor to be considered is breeding. Because an animal is purebred does not endow her with the ability to produce abnormally large amounts of milk or fat. Because a bull is purebred, it is not a foregone conclusion that his daughters will be abnormally high producers. Too many animals which are purebred, are bought and sold on their registry papers and not on their own merits or the meritorious work done by their ancestors.

The key to this situation is the bull. If, as we say, a bull is half of the herd, why object to paying the price for a good one? Too many men pay two or three hundred dollars for good cows and then will pay only fifty dollars for a bull calf, as a consequence getting an individual whose dam has no record or only a mediocre one and whose grandsires and dams are unknown from the standpoint of their records.

In buying a bull, be sure the females on both sides of his pedigree have good records both from the standpoint of milk and fat. Also be sure that the bulls on both sides of the pedigree show the ability to sire meritorious daughters. Then be sure that the bull, besides having these ancestral backings, is a good, strong typed individual. Calves sired by bulls such as these potentially have great possibilities at the pail.

Too many men do not pay enough attention to the raising of these calves. If the heifers that are added to the milking herd are to do their best work, their early feeding and care must be such that they develop to the maximum. Underfed individuals can never produce to the maximum of their natural ability even though well fed during production. The time to start feeding a heifer is while it is in its dam. Feed the cow well-balanced feeds, and a normal calf will be born; feed a ration made up entirely of wheat products, and the calf will be very weak or born dead.

As soon as the calf is dropped, it should be fed from two to three 8-ounce bottles of the dam's colostrum milk at once. This acts

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both as a laxative and a disease preventive. Allow the calf to stay with the dam for two or three days and then move it to a separate pen.

There are a few fundamentals which are responsible for successful hand feeding. First, feed the calves with warm milk, preferably as soon as drawn from the cow; Second, clean, scald, and air the buckets daily; Third, feed at regular intervals; Fourth, guide the feeding by the milk scales; Fifth, keep the calf hungry, for overfeeding causes digestive disturbances.

Calves just removed from their dams will require from 4 to 8 pounds of whole milk a day, depending on the size of the calf. Continue the feeding of skim milk until the calves are six months old.

As soon as possible, preferably as soon as the calves are fed skim milk, they should have access to grain. They learn to eat this readily if a small box of it is kept in the pen. As soon as the calf has had its milk, put some grain on its nose. Thus the calf acquires a taste for grain and is also less likely to suck other calves.

Jersey calves receiving unadulterated Jersey milk should be fed clean timothy or timothy and clover mixed.

Where no skim milk is available and there is a market for all the whole milk produced, dry grain mixtures, of which there are many on the market, or reconstituted skim milk and gruels are excellent substitutes after the calf is one month of age. Observe the same rules for sanitation and temperatures as you would for milk feeding.

Very satisfactory results have been obtained at the New Jersey Agricultural Experiment Station by substituting dry grains for milk when the calf is 30 days old. The calves are accustomed to these grain mixes during the third week and receive no more milk after they are a month old.

One ration consists of 100 pounds yellow corn meal, 150 pounds ground oats, 50 pounds wheat bran, 50 pounds linseed oil meal, and 50 pounds of soluble blood flour. Feed with the grain 3 per cent minerals composed of equal parts of finely ground limestone, steamed bone meal, and salt.

The calves are allowed to eat as much of this grain mixture as they want until they are 5 months old. The grain is kept in front of them all the time and replenished once a day. It is advisable not to put any more grain in the pail than they will clean up daily. Besides the grain they should be allowed to eat all the good mixed hay they will eat, and should have all the fresh water they will drink.

After the calves are 5 months

old, a ration of 100 pounds yellow corn meal, 150 pounds ground oats, 100 pounds wheat bran, and 50 pounds linseed oil meal should be gradually substituted for the other grain mixture.

Another satisfacory grain mix to use in the same manner consists of 20 pounds yellow corn meal, 10 pounds wheat bran, 20 pounds skim milk powder, 30 pounds ground oats, and 20 pounds linseed oil meal. Feed 3 per cent mineral mix with the grain.

This is a very satisfactory mixture to use if a good grade skim milk powder can be purchased at a reasonable price.

After the calves are 5 months old they also receive the corn, oats, bran and linseed ration.

During the first month of dry grain feeding the calves appear a little rough but when they are 3 months old the roughness disappears and at 6 months of age the calves are normal in height and weight.

Reconstituted Skim Milk

When no whole milk or fluid skim milk is available for feeding calves, reconstituted skim milk can be used with good results. Skim milk powder mixed with water in the ratio of 1-9 and fed at a temperature of 95-100° F. will take the place of fluid skim milk as a calf feed. This can be fed in amounts ranging from 12 to 16 pounds a day depending on the calf and may be continued until the calf is six months old.

Calf Gruel

Weigh out the amount of meal to be used. Add a small quantity of cold water to make a paste. Stir it vigorously until it becomes smooth. Then add a gallon of boiling water for each pound of meal used. Stir it well and allow it to cool to between 90 and 100° F. The milk and gruel are mixed before feeding. Always weigh accurately the amount of gruel and milk and always use a thermometer, feeding at the same temperature every time—not below 90°. The finger is a very poor thermometer.

One may start feeding gruel when the calf is 2 weeks old and replace the milk gradually until the calf is on full feed of gruel at 8 weeks.

Daily ration for Jersey calves to 8 weeks of age should be: 3 days to 1 week, 5 lbs. milk; 1 to 2 weeks, 8 lbs. milk; 2 to 3 weeks, 8 lbs. milk, 1 lb. gruel; 3 to 5 weeks, 5 lbs. milk, 3 lbs. gruel; 5 to 7 weeks, 2 lbs. milk, 7 lbs. gruel.

After the calf is 7 weeks old the milk can be entirely eliminated from the ration. Thereafter a vigorous well-grown calf will consume 13 pounds of gruel daily until taken off the gruel at the age of 4 months.

Calves receive, in addition to

the milk and gruel, limited amounts of mixed or clover hay after they are 1 month old. After they are 3 months old, alfalfa hay is kept before them at all times. Small calves are likely to eat more hay than they can digest, especially when it is fine and leafy and of good quality.

After the calves are a month old, they will eat a small amount of grain. A mixture made up of equal parts of hominy or corn meal, wheat bran, ground oats, and one-half of linseed meal is used and is fed immediately after the gruel. Calves may be taught to eat early by placing a small amount of the grain mixture in their mouths. They do almost as well on the whole grain as on the ground grains. After they are 4 months old, they may be fed exclusively upon the grain mixture, and good alfalfa or clover hay. They should be fed liberally.

Preparation for Freshening

When the heifers are six months old, they should receive from four to six pounds of grain a day plus all the good hay they will eat.

From 1 year of age until 2 months before calving, the heifers can be roughed over with all the good grass silage and hay or corn silage and hay or hay alone they will eat in the winter plus good pasture in the summer. By following this method of feeding the yearlings, less trouble should be experienced with getting the heifers safe with calf when breeding at 16-18 months of age.

Two months before calving feed, in addition to the roughage, or pasture, 6 to 10 pounds of grain a day until a week before calving. The amount of grain fed depends on the condition of the heifer.

One week before calving, substitute for the grain ration one containing 2 parts of bran and 1 of ground oats and ½ part of linseed oil meal. Six to eight hours before calving, feed a warm bran mash sweetened with molasses. Limit the hay fed to one half the usual amount.

If everything appears normal at calving time and the calf is being presented normally, do not bother the cow. As soon as the calf is dropped paint the navel with iodine to prevent infection and then feed colostrum.

Immediately after calving give the cow warm water and a bran mash with molasses. For a day or two afterward feed bran mashes in addition to alfalfa hay. During this period it is advantageous to warm the drinking water. For the next few days a mixture of 2 parts bran, 2 parts ground oats, and 1 part linseed oil meal may be fed.

Great care should be exercised in getting the cow on full feed. Preferably this should be accomplished in about three weeks.

How Long Is a Root?

Condensed from Pacific Rural Press

AMONG the wonders of agriculture is a story which ought to be better understood, and which ought to greatly increase the interest in cover crops.

Several years ago experimenters in Canada released some figures which were so astounding that it sounded as if the report had been written by Paul Bunyan, the mythical character, created by the Liars of the North Woods, rather than by scientists.

Perhaps the shock to belief brought by this report was responsible for the fact that the Iowa State College at Ames undertook similar experiments and made a report which also taxes belief.

Experimenting with a winter rye plant, it was found that the transpiration surface of the top of the rye plant amounted to the surprising figure of 51.4 square feet. That's a lot of breathing space for a single plant.

When they calculated the absorbing surface of the root system, however, they found the figure to be 6,875 square feet.

This one rye plant had 13,800,000 roots, and when they made an estimate of root hairs, the figure went into the billions—14,335,000,000. The total length of the roots was 32.26 miles; the length of the root hairs was 6,603.86 miles, or a grand total of 6,636.12 miles.

That's the way it was reported by the Iowa State College.

The point is that when you look at the top of a cover crop plant, which may not have made as much growth as you hoped for, and wonder if you're going to put very much humus into the soil by turning it under, you ought to remember that you have already put into the soil a great many times that much humus through the roots.

Between the tops, and the root system, which may be a hundred times or more as extensive, you have veined every fragment of that soil with humus and put it in position to be a living, breathing, friable bed for further growth.

Another wonder of the roots is the extreme distance to which some roots will go for water. Alfalfa, for instance, will send its roots to great distances, searching for water. Hydraulic miners have sometimes reported alfalfa roots as much as a hundred feet below the surface.

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Handsome Is as Handsome Does

Condensed from Successful Farming

Cameron Hervey

STANDING among Wilfred Denisen's crossbred pigs, Pete Holand told the intent swine-tour crowd of the excellent production figures of this herd. He told how Denisen for the last three years had been selecting his gilts and boars from production records rather than by type. He told how in 1939 the average weight of all the litters on this farm at 56 days was 237 pounds; in 1940, 246 pounds; in 1941, 263 pounds. He told how, in but five months' time, the 1941 crop of pigs had been made ready for marketing.

"In view of this record, I think you will agree," Holand stated, dryly, "that whether these pigs' tails curl east or west matters but little."

Anyone who could spend a few days with Pete Holand visiting the herds of the Austin Area Swine Improvement Association, probably would come away convinced that Holand knows what he is talking about. Employed by the Austin, Minnesota, Public Schools, he spends his time supervising the Association and in other educational activities among hog raisers of the community.

It was in 1938 that the Austin Area Swine Improvement Association got under way with 53 members. The purpose of the Association, as Holand explains it, was to produce better hogs by keeping detailed records of the individual sows in every herd. Holand didn't think much of the accepted practice of selecting the breeding herd by appearance. "You can't tell how far a frog will jump just by looking at him," he explains.

It's easier, Holand says, to pick a boar or sow for your herd that some judge has decorated with a blue ribbon than it is to earmark the litters at birth or shortly after, weigh them at 56 days and perhaps again at 160 days, and from these records select your breeding stock from litters that prove to be in the fastest and most economical growers. "But it's not the right way."

The fact that membership in the Association has more than doubled, that seven out of ten herds have shown marked improvement in average litter weights at 56 days, that the majority of pigs are ready for market in from five to six months,

Reprinted by permission from Successful Farming, Oct., 1941, Des Moines, Iowa

and that most of the members are reaping increased profits is convincing proof that the Austin hog raisers are on the right track.

The records have shown that Pete Holand was right about judging a hog by his appearance. Those producers who have had cut-out tests run on their market hogs found that the ones that weighed most at 56 days yielded the most pounds of pork and graded best in carcass form. The "right type," they've concluded, is pretty much tied up with the ability to make fast gains.

Improved feeding, sanitation, and management practices are essential parts of the Association's program. "After all," argues Holand, "no amount of earmarking and weighing will help much unless you have healthy, well-fed, and well-cared for hogs."

So successful has the Association been that similar organizations are springing up all over the nation.

New Oat Tests 40 Pounds

VICLAND, a new variety of oats announced by Wisconsin Experiment Station, was developed for resistance to rust and smut, but it has some other extremely valuable characteristics. Among them is heavy test weight and high yield. It is a yellow variety, has a plump, chunky berry that is low in hull content, and test weight has been running 40 to 41 pounds a bushel.

Richard Hopkins, Columbia county, produced 2,100 bushels on 20 acres, an average of 105 bushels an acre. John Nichols, Walworth county, got an average of 93 bushels an acre on 17 acres.

"It must be remembered that these yields were in a good oats year, the like of which we may not see again in the next 5 years," said L. F. Graber, of the station's crops department. "However, it is in the unfavorable years that we expect Vicland to shine. In 1938, a poor year for oats, it averaged 69 bushels an acre, State Pride 34, and Forward 25.3.

"The new oat is a cross between Victoria, a South American variety, and Richland, a Russian variety. Richland is a good oat except for its susceptibility to smut and crown rust. What the station did was put the good qualities of both into one variety.

Vicland has not been tried over a wide enough area to determine whether it will prove as desirable farther south as it has proved in the state of its origin. Seed will be ready for distribution in the fall of 1941. —*Capper's Farmer*

Tenants Share Garden

Condensed from Southern Agriculturist

H. P. Stuckey

WHEN Ransom Aldrich, prominent farmer and cattle breeder, started a community farm garden for the 12 families on his farm at Michigan City, Mississippi, back in 1937, he had no idea that he was getting a four years' start on a Food for Defense Program to be launched by the U. S. Department of Agriculture in 1941. His object was to work out an economical method of producing food for these families instead of having to furnish tools and other equipment and materials for 12 separate garden plots. The big problem was to convince each family that they were not going to do more work than their share, Mr. Aldrich says.

As it turned out, he saved $600 last year on "furnish," an average of $50 per family. And the farm workers and their families had an almost ideally balanced diet of fresh vegetables throughout the year as a result of the labor and food distribution system which Mr. Aldrich worked out.

When the eight-acre community garden was established, it was laid out on a well-drained area of good, terraced soil. Rows are run on the contour to control erosion and conserve moisture and plant food. Seasonal vegetables are planted at ten-day intervals, worked like regular field crops, and given the same careful attention as crops in a commercial truck garden, under supervision of the farm manager.

Mr. Aldrich furnishes the land, tools, fertilizer and other equipment and materials. The number of work hours and the distribution of food is based on the number of persons in each family. When the garden begins to yield, some member of each family brings a basket to work in the morning and takes his share of the vegetables home in the afternoon.

All surplus vegetables are canned and stored, and distributed after the fresh vegetables are gone. Mr. Aldrich furnishes the pressure cooker and supervision for the canning operation and gets every fourth can. Special care is observed in distributing the vegetables so as to give each family a scientifically balanced diet during the winter. There were 180 cans of vegetables left

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over in the middle of May this year when the summer vegetables began to come into production.

About half the garden, or four acres, is planted to Irish and sweet potatoes, watermelons, cantaloupes and roasting-ear corn. The corn is followed by fall potatoes. Vegetables in the remainder of the garden include spinach, kale, radishes, cabbage, collards, okra, tomatoes, English and field peas, snap beans, butter beans, squash, cucumbers and onions.

In addition to farming and raising prize-winning Black Angus cattle, Mr. Aldrich is president of the Mississippi Farm Bureau and a commissioner in the Northeast Mississippi soil conservation district. But he still has time to take an interest in his community garden.

Any farmer with a number of families on his farm can profit by such a project and help carry on the Food for Defense Program at the same time, Mr. Aldrich believes. His experience has been that it not only saves him money in furnishing the families on his farm, but also helps keep them healthy and able to do more and better work.

Pigs

That cost of gains gradually increases as pigs grow larger, fatter, and heavier is indicated by tests conducted at the University of Illinois College of Agriculture. It was found that it takes about 7.8 bushels of corn to produce 100 pounds of gain in hogs weighing 150 and 200 pounds; 8.5 bushels for hogs 200 to 250 pounds; 9.6 bushels for hogs 250 to 300 pounds; and 10.7 bushels for hogs 300 to 350 pounds. On pasture, the corn required to produce 100 pounds of gain is reduced 12 to 15 percent.

—*Successful Farming*

Grinding Down Feed Losses

Condensed from Kansas Farmer

Roy Freeland

EVERY farmer with livestock pays for a feed grinder, whether he owns one or not. This is the solemn conviction of Albert and William Kaine, big-scale stockmen in Pottawatomie County, Kansas, who are convinced that the man without a grinder actually pays for one in the waste of good feed.

The Kaines grind down their losses by grinding the feed, and their system offers striking contrast to methods of a few years ago when grinding was limited primarily to grains. With a mill that chops, grinds and mixes, they consider that preparation of rough feeds, as well as grains, is one of the most important factors in any successful stock-feeding program.

The principal job for their versatile mill at present is to chop sorghum forage for 4,300 lambs now on feed at their place. Shocked feed in the field is hauled direct to the mill, where it is converted into a palatable, chopped roughage, which can be eaten without waste of stalks or other coarse parts.

On the Kaine farm, this type of roughage is preferred over silage, for the feeding of lambs. They point out that silage contains too much acid for best results with lambs, while the chopped forage is desirable in every respect. Their preference for ground dry feed over silage reflects the general opinion of experienced lamb feeders throughout the state, according to R. F. Cox, of Kansas State College, who is in charge of lamb-feeding investigations.

Hog raising is another important part of the Kaine operations, and even the hogs eat some chopped roughage. This year the Kaine hog-raising program includes the farrowing and feeding out of more than 1,200 head of pigs, in spring and fall litters from 80 brood sows.

During the gestation periods, these sows receive a ration consisting primarily of chopped alfalfa hay and ground corn. The alfalfa and corn are mixed as they go through the mill. Containing about equal parts by weight of alfalfa and corn, the mixture is fed in self-feeders. In addition, the sows receive a pro-

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tein concentrate which is hand-fed at the rate of one-fourth pound a head, daily.

For cattle, the value of grinding is demonstrated in typical fashion by Carl and Martin Masenthin, progressive Osage county farmers. With a herd of more than 50 good Shorthorns, handled under practical farm conditions, the Masenthin brothers follow a plan of grinding all forage feeds.

They have found that grinding reduces by half the amount of sorghum fodder necessary to supply the needs of their herd, because stalks and all are eaten in the ground form. At the same time, grinding changes the feed into a form much more convenient for handling. Ground roughage can be handled in baskets, or with a scoop shovel. It can be fed conveniently in a trough or feed bunk, and cattle cannot pull it out into the mud as they can a bundle of fodder.

Storage convenience of ground feed is considered an especially important factor on the Masenthin farm. They figure a load of fodder in chopped form requires about one-fourth as much space as in bundle form. In times when fodder is dry, the Masenthin brothers may bring in a reserve supply capable of supplying their feed needs for several days or several weeks. The fodder is chopped and blown into a bin or mow. It can be fed out just as silage is fed from a silo.

The Masenthins do not claim that ground corn or sorghum forage is superior to silage, pound for pound, in cattle feeding. However, they do prefer this system of feeding over the use of silage. They call attention to the fact that fodder can be hauled in and chopped whenever convenient, while silos must be filled at a time when the average farmer is extremely busy.

Having followed the plan of grinding rough feeds for about 7 years, Carl and Martin Masenthin have not overlooked the advantages in chopping their alfalfa hay. They find it reduces necessary storage space about half, and increases the feed value noticeably.

Most grinder owners save time and expense by grinding and mixing different grains and roughages, all in one operation. This is a popular practice on the farm of Sherman Mertz and son Lawrence, lamb and cattle feeders in Wabaunsee County. They are fattening 3,000 lambs this season and, as usual, their lambs were started on a feed containing equal parts of ground sorghum fodder, prairie hay and alfalfa hay. The 3 feeds are ground and mixed all at the same time, by feeding equal parts of each into the hopper of the mill.

Farmer experiences with

ground feed are borne out rather consistently by tests at Kansas agricultural experiment stations. Lambfeeding tests conducted at Garden City by R. F. Cox and F. A. Wagner, in 1937-38, give a comparison of sumac silage, ground sumac fodder, and a combination of the 2 in which fodder was fed 60 days and the silage for the remainder of the feeding period.

Largest gains were produced by the fodder. A combination of fodder and silage produced the second-largest gains, while silage alone ranked third. Cost of a hundred pounds of gain averaged $5.34 for lambs fed fodder, $5.92 for those receiving both roughages, and $6.76 for those fed silage alone. Each lot of lambs received milo grain, cottonseed meal and ground limestone, along with the roughage.

Even more striking results were obtained at Garden City in 1932-33. Ground Atlas fodder in the lamb-fattening ration produced average gains of 22.13 pounds in a 75-day feeding period, while Atlas silage in the same ration produced only 17.89 pounds of gain. Average daily gains were .30 pound for the ground fodder, and .24 pound for the silage.

In cattle-feeding tests, ground fodder has shown a marked advantage over bundle fodder, but has failed to produce as rapidly as silage. In 3 successive tests conducted by Dr. C. W. McCampbell and L. C. Aicher, at the Hays station, grinding sorghum fodder for the winter ration of stock cattle increased daily gains from 1.26 pounds to 1.45 pounds a head. Gains from an acre of land were increased from 222.11 pounds to 283.65 pounds, by grinding the fodder. It undoubtedly pays to grind the feed.

In a single, later test, grinding increased the acre-gain from 162.59 pounds to 237.35 pounds. In this test, the feed value was increased 46 per cent by grinding. The sorghum roughage, in each instance, was supplemented with 1 pound of cottonseed cake a head, daily. Comparing ground fodder with silage in three successive tests with yearling steers, the fodder produced 1.45 pounds a head daily, while sorghum silage produced 1.59 pounds daily.

A Pasture That Does Not Take "Annual Leave"

Condensed from Soil Conservation

Glennon Loyd
Soil Conservation Service

ED G. JECHE, a farmer living 4 miles east of Spring Valley, Minn., does not join in the chorus when his neighbors lament meager milk production in the latter part of July and in August. He merely smiles and thinks of his 25-acre pasture that doesn't go on "annual leave" and cause his Guernsey herd to let him down.

In late summer little rain falls in the southern Minnesota dairy country where Jeche lives, and a brilliant sun frequently drives temperatures to the 100° mark. Bluegrass takes a well-earned summer nap, and most of the meadows sprout no new spears of succulent grass.

This is always a time of fretting for the thrifty farmers of southern Minnesota who do not like to see their cream checks dwindle while waiting for the reviving fall rains.

Jeche for some time has been numbered among those farmers concerned about late summer meadows as well as about soil erosion that was thinning crop yields year by year.

Thus it was that in 1937 this farmer welcomed the opportunity to become a cooperator in the Deer-Bear Creek soil conservation demonstration project that had its headquarters at Spring Valley.

He and the project technicians drew up for his rolling 200-acre place a farm-conservation plan that met not only the erosion problem but also that of adequate summer pasture for his expanding Guernsey herd.

This 63-year-old farmer was as deeply concerned about the soil that had washed away from the land as he was with the lack of pasture. Jeche's father homesteaded the place in 1859 and Jeche was born there in 1878. He did not have to be told that more than half of the topsoil had washed away from most of his hillsides—and hillsides are all you can find on his place. Gullies had begun to sprout up like weeds.

Each November, Jeche ob-

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served that he must travel up and down more and more rows before putting the sideboards on his husking wagon. Each August the threshing machine told him that his yields of oats, barley, and wheat were slipping.

It had become harder and harder to get a catch of red clover. Bluegrass alone had failed, and timothy fields with a few sprigs of clover looked pale and thin.

Today the situation is greatly changed. All of Jeche's tilled land is strip-cropped on the contour. His 5-year agreement with the Service expires this spring but he says he will never go back to farming parallel with the fence lines—"not after the experience we've had with this."

"I didn't think we would like the strip-cropping," he said, "But we do like it now, and we know it does the land a lot of good. We don't have the washing we had when we worked the land up and down hill."

But this quiet farmer's enthusiasm is most noticeable when he talks about his 25-acre pasture that provides feed aplenty from mid-May until it is blanketed with snow for the winter along in November. He has 18 cows and 16 head of heifers and calves on the pasture for the 6-month period. When they are on the pasture, he does not barn-feed the cows—and he told us that when he finally switches them over to winter feed, he does not experience a jump in butterfat production.

His records disclose that his butterfat production has been on the increase since the pasture began yielding in 1939. His 1938 butterfat production averaged 257 pounds per cow, while in 1940 the average was up to 292 pounds.

Of course, Jeche does not attribute the increasing production to the pasture alone. He does point out quickly, however, that it provides feed for the herd for half the year, and that there is no labor involved for seeding, cultivating, or harvesting crops.

The threshing rig was in the barnlot the day we stopped to see Jeche, but work or no work, Jeche was not too busy to tell us about his pasture.

The Guernseys were grazing contentedly in the pasture and, judging from its appearance, that pasture could have supported the two neighbors' herds for quite a while, along with the Guernseys. The neighbors had just as many acres of pasture per cow, but their grass was "toast" brown.

One must not get the impression that the pasture is the most fertile piece of land on this farm. One part of the farm was so steep and undulating, and so shot full of gullies, that it did not lend itself to contour cultivation—that

part is the pasture today. Most of it lies on a 12-percent slope.

In 1938 it was seeded to a new type of pasture mixture with a nurse crop of barley. The mixture was comprised of sweetclover, alfalfa, brome, and timothy. About 5 pounds of each were seeded to the acre.

Yield data taken from the pasture, in co-operation with the agronomy division of the University of Minnesota at St. Paul, tell why Jeche's butterfat production does not slump in the summer. On the basis of 15-percent moisture, the pasture produced the equivalent of 3.66 tons of hay per acre in 1939, 3 tons in 1940 and an estimated 3.19 tons in 1941.

With an electric fence that parallels the main waterway of the farm, Jeche has divided the pasture into two almost equal fields. This makes it possible to manage the sweetclover so that some goes to seed in one of the fields every year. Otherwise, he switches the stock from one side to the other so as to keep both parts properly grazed.

This year the pasture did its intended job just as well as it did last year and the year before, and there is no prospect that it will slow up. As a backstop, however, Jeche depends on the three fields adjoining the pasture. Since two of them each year are in hay as a part of the crop rotation for the farm, they are ready for supplemental pasture duty, if needed.

How valuable a good pasture can be in sudden emergency was demonstrated to Jeche on July 10, 1940, when he was completely "hailed out." His record book shows his yields for corn and small grains as all zeros. The pasture, beaten into the ground by the hail that denuded most other vegetation, recovered within a week.

Cozy Sun Coop for Layers

Hens at the A. C. Erb farm in Ward county, North Dakota, get their sunshine in a low sun coop built at one side of the laying house. It is cozier on clear afternoons than the house itself, for it is covered with a glass substitute that permits passage of ultra-violet light rays. Heat radiated by the sun warms it up quickly on chilly days. A few hen-size openings into such an annex instead of a large door or open side will make the main house warmer at night.

—Capper's Farmer

Cotton Grown to Measure

Condensed from Farm Journal and Farmer's Wife

R. W. Howard

HOWARD DOANE is a long-headed farm trouble-shooter from St. Louis who sometimes works on the theory that more progress is made backing up than going forward. During the past six years his thinking has backed 15,000 acres of Mississippi's delta off the old, accepted thought-track that "cotton is just cotton."

Today those acres are heading down a new mainline by growing specific types of cotton for specific industries. They're doing it on a basis of guaranteed performance and consistent quality.

Yet in 1936, all the cotton grown on Robertshaw Plantation, ten miles east of Leland, Miss., was the same humble-jumble of "average staple" the rest of the Delta has grown these 100 years. Many fiber lengths to the boll. A hundred stress tests to the bale.

The story of the intervening years is a story of painstaking labor, of minute selections by a young plant breeder out of the Mississippi hills, of successive grins, wonderment and pride from plantation managers and sharecroppers. Viewed in silhouette against the dark prospect of the rest of Cotton's crumbling kingdom, it is full reason for Lon Applewhite and his thirteen children to sing "Dey's gonna be a new day."

"I think it started with the old axiom of Mahomet and the Mountain," Doane recalls. "Manufacturers lost interest in American cotton because of the mess cotton men have allowed their business to get into. The majority of the crop still goes through the hands of middlemen who destroy producer labels and identities. Their grading system is based on varying human judgment rather than durability or uniformity. Cotton that makes good sheets, or sneaker tops or tire cord one year cannot be reordered the next year, because the broker himself doesn't know where those particular bales came from. And if he does, the chances are 9-to-1 that the producer was depending on a lucky freak of Nature rather than his own ingenuity to produce that kind of a crop."

We were standing in the middle of the Robertshaw test plot, fifty by 300 feet, hidden from the

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commissary and the wheezing thump of the gin by a row of osage orange trees. At the end of the plot stood Lon's two-room cabin, symbol of the level to which King Cotton has forced his subjects through the slip-shod years. Lon himself, grinning and humming, walked along the rows with John Oakley, the young plant breeder, his arms loaded with one-pound paper sacks.

Doane went on. "When manufacturers discovered that they could get fiber of uniform strength and quality year after year from rayon and similar products, they cut down their purchases from Cottonland. That's when we decided that the producer must go directly to the factories and find out what they wanted.

"We found, first, that they don't want pretty cotton, despite the fact that planters have been taught to sun crops to make them whiter. Oxidation takes half the strength from cotton awning in one year. Bolls sunned in the fields lose a high proportion of their strength.

"They do want cottons to meet specific demands. Tire cord manufacturers, for instance, want a cotton that will spin into smooth, tough fiber with a great deal of resilience. Stocking and sock makers want a soft, long fiber that feels like silk but withstands body moisture and acids. Sneaker makers need a rough, tough fiber to take up the scuffs and thumps small boys indulge in. Fire hose weavers have other fiber specifications. So it goes through all industry.

"Then," he finished simply, "we came back here to grow them."

Howard Doane isn't a cotton-man. The owners of Robertshaw's 7,000 acres called on him for advice for the same reason that hundreds of other landowners, big and little, have called him. As an agricultural ideas-man he's tops. And one of the big reasons for it is that he is able to back up mentally for a better start on the long pulls.

First thing he did after talking with the cotton millers was to sit down for a long, out-loud think with W. J. Godbold, the plantation manager. After that he went looking for a youngster with a "green thumb" who had no set notions on cotton breeding, or production. He found him in John Oakley, a farm boy from Starkville, Miss., who had decided he wanted to be an agronomist. Oakley was just graduating from Mississippi State College with all expenses paid by himself and $150 in the bank solely because he had the gumption to work seven hours a day in a local bakery while carrying a full college course. He came down to Robertshaw with his widowed

mother in late June, 1936, and spent the entire summer doing what old Lon thought was "jus' pokin'."

By fall, Oakley had examined every last plant in the 3,000 acres of cotton, had selected 1,400 plants that seemed to be different from their neighbors. Each one of the 1,400 was indexed in a set of office records according to the size of its stalk, the way the bloom was put on, and the like.

Into its own bag went the bolls from each of those 1,400 plants. Oakley put on identifying marks and carried them off to a shed behind the commissary.

Before the spring of 1937, Oakley worked the bolls from each plant through a miniature gin and classified its fibers for tensile strength, fineness, uniformity and maturity. Finally the best and worst samples from each stalk were sent for a final check-up to R. W. Webb, the federal technician, who had just developed a special character chart for cotton.

That winter's work was the basis for Robertshaw's standards in breeding new cottons for specific industrial uses. Next spring the seeds from bolls that were really different were planted in the experimental plot behind the osage orange hedge. To prevent cross-breeding, Doane and Oakley adapted the hybrid corn-breeding stunt. They hand-pollinated each bud, then tied a paper sack over it to prevent cross-pollinating.

"Plant breeding," Doane explains, "is a deadly, sharp-edged tool, a weapon only for the expert. In Oakley, we were just fortunate enough to find a born agronomist. After setting up standards, we inbred plants so long that only the good qualities survived. They were runty looking things that no buyer would look at twice. But we'd backed them up to the point where every single, last trait was pure. Then we cross-bred with plants having other desired qualities. The combinations really went to town."

To meet the specifications of tire cord and awning manufacturers, Oakley and Doane first went after a cotton whose fibers would test 80,000 lbs. tensile strength to the square inch. They achieved that, stepped up their standards again. Last fall, for the first time, they produced field cotton testing 101,000 lbs. to the square inch.

Another problem to be licked in custom-grown cotton is uniformity. Although market quotations are based on staple length, one boll of average field cotton contains fifty to one hundred different lengths of fiber. Through that same painstaking system of selection and cross-breeding, Robertshaw now produces cotton whose fibers are 81% uniform.

(Its index of variability is 19%.)

But Robertshaw's owners and managers didn't stop with breeding. Both they and Doane feel that they are working for the whole South . . . for her mortgaged plantations, her lackluster sharecroppers, her white and black youngsters who can look only to the cities for success.

Neighboring planters dropped in of an afternoon to see what the gossip was about. They saw the new fields of hybrids, nodded approval at their uniformity, made mental note of the fact that shrewd Manager Godbold was playing a two-threat hand by planting soybeans in between the fields of specialized cotton, first, to prevent cross-pollinization between fields and secondly, to get a reserve cash crop.

They saw John Oakley puttering, in spare moments, with the funereal red and green stalks of castor plants. They listened to a sermon so simple and so old that its very meaning had been forgotten . . . the fact that cotton is not grown for mammy-singers or movie scenarists or brokers, but for manufacturers, and through them for the varying budget of Citizen Joe Doakes. One by one, they took home a few of the Robertshaw seeds to plant behind their own commissaries.

This year, there were 15,000 acres of cotton grown across the Central Delta from Robertshaw seed. Trucked back to the Robertshaw gin, it was baled and labeled under one of the four "Bobshaw" industrial brands. Each bale is guaranteed as to uniformity and tensile strength.

Oakley and his assistants are carrying on in a spic-and-span new laboratory where the old shed used to stand. Next year or the year after, they will have twenty-five strains of cotton, each grown to meet the exacting specifications of a particular type of industry . . . fire hose . . . sneaker tops . . . freight-car couplings. Moreover, most of them will yield better than a bale to the acre.

The bales, instead of going through the brokerage routine of sample pulls, varying weights, and regrading, move directly to the compress of the Staple Cotton Co-operative Association at Greenwood, Miss., to await calls from the mills. The growers know where their crop is sold. Fifteen hundred miles away manufacturers using Bobshaw strains have, at last, a cotton grown to their needs. They are able to give the planters advice on its reactions to machines and wear. For the first time in their lives they know that if Nature permits a crop next year it will be as good as this year, perhaps better.

Finally, and to Howard Doane of greatest importance, Bobshaw's system may at long last

help the South to help itself. Lon and I stood beside his cabin the next afternoon. "Mistuh Doane say," he told me, "we gittin' round to th' point wheah we can do some long-time thinkin' about all us.

"We bin growin' cotton jus' foh cotton. Now, we grow cotton foh de shoe, foh de auto tire, foh de freight train and de sock. We in Business foh de fus' time in ouh lives. Maybe gonna be uh new day foh cotton . . . all way down de line."

Handling Hogs To Increase Pork Production

Condensed from Hog Breeder

W. M. Beeson

Associate Animal Husbandman, Agricultural Experiment Station, Moscow, Idaho

PORK products are among those listed by the government as essential to meet the demands of our national emergency. They are easily transported, can be stored without refrigeration, and are high in essential food nutrients.

A program of increased pork production can be accomplished by many a farmer without materially increasing his investment in livestock, buildings or equipment but rather by better feeding and management of the hogs and feed on hand.

A few simple rules for making the fattening hog do its part in the national defense program for more pork follow:

Full feed on home-produced feeds. Give the pigs all the concentrates such as wheat, barley, corn, peas, that they will consume by use of a self-feeder or full feeding by hand. It pays to full feed hogs.

Supplement grain with protein. In a separate compartment or self-feeder give hogs free access to meat meal or fish meal or still better a mixture of the two 50-50 by weight. Hogs are "food wise" and will eat only enough protein to balance their diet for the most rapid and economical gains. Self-feeding permits pigs to balance their own rations. Skimmilk, buttermilk, or whey may be substituted by feeding an average of a gallon of liquid per pig daily.

Provide good pasture. During the pasture months considerable saving can be made by utilizing pasture along with a full feed of

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grain and supplements. Plentiful pasture, provided by mixed grasses, alfalfa, peas or sweet clover, will save about 15 per cent of grain and 50 per cent of supplements required in dry-lot feeding. Give pigs free access to grain and protein supplements on pasture.

Feed alfalfa and minerals in drylot. Dry-lot rations for fattening pigs should contain 5 per cent of good quality ground alfalfa hay; or give the hogs free access to extra leafy, fine stemmed alfalfa in a rack. Alfalfa supplies vitamin A which is necessary for the well being of the pig.

Calcium and salt are the only supplementary minerals needed for fattening hogs. Give the pigs free access to a mixture of 2 parts of ground oyster shell (flour fineness) and 1 part of salt, or mix 1 per cent of oyster shell and 0.25 per cent of salt in the grain.

A good way to self-feed hogs in dry lot is this: In one compartment of the self-feeder provide a grain or grain mixture that has been ground or rolled and mix in 5 pounds of ground alfalfa, 1 pound of oyster shell and ¼ pound of salt. In another compartment give the hogs free access to a protein mixture of meat meal, 40 pounds; fishmeal, 40 pounds; and linseed oil meal, 20 pounds. This method has given excellent results in fattening hogs on the experimental farm of the University of Idaho with a minimum of labor and feed.

Use self-feeders and save labor. A shortage of men and increased wages has made it imperative that farmers use labor saving equipment. A good self-feeder will save time and labor and assure adequate feed in the proper combinations at all times for the pigs.

Prevent worms. Feed pigs on clean ground (ground free from pigs for one year). If pigs have worms, treat them at 10 to 12 weeks of age, preferably shortly after weaning and before they are put in the fattening pen.

Dip for mange and lice. To prevent these dip or spray the pigs when 10 to 12 weeks of age using a mixture of 20 gallons crankcase oil to each 5 gallons of kerosene, or use diesel or fuel oil. Avoid using crankcase oil containing an excess of gasoline or the gasoline will blister the pigs. Spraying hogs with an emulsion of oil and water about every month during the fattening period tends to curb the occurrence of mange and lice.

Farmers can increase the fall pig crop 20 to 30 per cent by observing a few common-sense rules in hog management.

Clean and disinfect farrowing houses with boiling water to which has been added one pound of lye to 15 gallons of water.

Equipment should be washed in a similar manner.

Wash the sow with warm soapy water before moving her to the clean farrowing house.

Move the sow to the farrowing house about a week before farrowing.

Make the sow's ration bulky by replacing the grain with one-third wheat bran or ground alfalfa.

Be sure the sow's ration contains tankage or meat meal, 5 to 7 per cent, or 1 gallon of skimmilk or buttermilk daily; ground oyster shell, 1 per cent; free access to alfalfa; and iodized salt; ½ per cent.

A sow should be fed about 1 pound of a well balanced grain mixture per 100 pounds of liveweight during gestation and about 1½ pounds per 100 pounds liveweight during lactation.

Provide pens with guard rails and if weather is severe an electric pig brooder will help.

Keep a shovelful of clean sod in each pen to prevent anemia.

Allow pigs to have free access to sunshine. Don't keep them indoors too long.

Provide good pastures for sow and pigs; this saves feed and eliminates a large number of nutritional deficiencies which might occur in dry lot feeding.

Pasturing Cornstalks

Cattle turned into stalk fields from which corn has been husked are as likely to lose weight as to gain. Ten dry cows turned into a ten-acre field at the University of Illinois for 24 days after hand husking lost 37 pounds per head (average of four years' results). Beef calves unloaded from cars showed some gain, but the gain was "fill." All in all, the Illinois trials prove that stalk fields alone should not be the only source of feed for beef cattle, even for short periods, in late fall and early winter.

—Farm Journal

A New Venture in Farm Forestry

Condensed from American Forests

Weston Donehower

MANY people have the impression that a great cornbelt state is not particularly concerned with forests and forestry. But this is not true. Indiana, for example, ranks forest crops eighth in value. Its forest industries are widespread and diversified; and in December, 1939, Indiana initiated the first work in this country under the provisions of the Cooperative Farm Forestry Act, passed by Congress in 1937.

This is more than historic. It reflects both the importance of farm forestry to the country and the value farmers themselves are placing on their trees and woodland. For years the nation's 185,000,000 acres of farm woodland have been steadily deteriorating in spite of efforts by many interested agencies. Scattered widely on more than 6,000,000 farms, and representing nearly twenty per cent of the total farm land in the nation, the farm woodland problem remains one of the most important and challenging in land use and conservation today.

The Congress, in passing the Cooperative Farm Forestry Act, has taken account of this situation. Authorizing the Department of Agriculture to cooperate in the development of farm forestry with landgrant colleges and universities and state forestry agencies, the Act provides for assisting farmers in good woodland management. It provides for tree and shrub planting stock, for protection of eroding land, and for production of wood products. It provides for aid in harvesting, utilization, and marketing of wood products, and contains provisions also for carrying on investigations related to these problems.

An important part of the new program started in 1939 is the intensive projects established to determine what farm woodland management can do for farm economy. A limited number of farmers with representative farm woodlands become co-operators with the Department of Agriculture, either directly or indirectly through the state. A forester is then assigned to study the problems of growing and marketing timber within the project bound-

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ary and to advise farmers about silvicultural and utilization practices. With an inventory of woods conditions at the start of the project and a record of what happens subsequently, these projects will tell the story of what forestry can do for the farmers.

Prior to the establishment of project headquarters in December, 1939, a program setting forth the various work problems was developed by state agencies interested in farm forestry—the State Department of Conservation, the Purdue Agricultural Experiment Station, and the Purdue Agricultural Extension Service—in cooperation with the Soil Conservation Service, the Forest Service, and the Bureau of Agricultural Economics of the United States Department of Agriculture. Areas were then selected within which the farm forestry work was to be initiated, the first in southeastern Indiana with headquarters at Madison, the second in the north central part of the state with headquarters at South Bend.

The various state universities and agricultural experiment stations have carried on investigations for years and have built up a fund of knowledge on farm woodlands. These studies have definitely shown the deteriorating effects on woods of continued grazing of livestock, and the corresponding ill-advised economy of attempting to produce meat on woodland forage. They have pointed out how the people of Indiana realize annually an income of $14,000,000 from raw materials of the woodland—materials which are manufactured into articles worth $140,000,000 and affect the welfare of industries employing 32,000 people. Furthermore, it is shown that in spite of this over ninety-nine per cent of the forest fires in Indiana are man-caused and therefore preventable.

Much helpful advice has been made available in the form of publications dealing with various marketing and utilization aspects of woodland products such as logs, crossties, piling, basket stock, and with tree planting and woodland improvement. The state extension forester and county extension agents have provided helpful assistance to land owners for a number of years and evidence of their work may be seen in practically every county. A splendid system of state forests and parks has been developed, and the State Department of Conservation, in charge of this public estate, has done much to bring about increased interest in and support of all conservation measures. Under the provisions of the Indiana forest classification act some 1800 farm woodland owners have taken advantage of a more equitable tax

system by having approximately 110,000 acres of woods and plantings classified for permanent woodland use. More recently, other government agencies have provided definite assistance in fostering farm forestry as part of their programs dealing with conservation and land use.

It was to learn something of the farm forestry problem that the writer recently visited the Hoosier State with its 3,000,000 acres of farm woodland. One is surprised at the extent and value of the timber, at the great diversification and widespread distribution of wood-using industries, and at the amount of work accomplished in conservation by the state and local agencies. In Jefferson County, for example, the 1935 census shows thirty-two per cent of the 39,595 acres of farm woodland under protection from livestock. In October, 1939, fifty tracts of farm woodland, totalling 3,200 acres, had been entered under the Indiana forest tax law. Thousands of trees from the forest tree nurseries of the State Division of Forestry had been planted on eroding land.

At the farm forestry headquarters at Madison, Joe DeYoung, forester in charge of the project, was anxious to explain the work. "We're mighty proud to have the first project down here in southern Indiana," he said, "and we've a lot to show. This community is really interested in conservation."

Having his headquarters in the office of the Jefferson County extension agent "helps to tie the work in with all county land use planning," he explained.

Later, as we strolled through the woods on his farm near Madison, I listened with interest to Howard Clashman, secretary of the Jefferson County Farm Forestry Committee, who was the first to sign a farm forestry co-operative agreement. "When the forests were here these people lived well," he said. "They had timber for their buildings and farm use, plenty of good fuel, and many a dollar was derived from the sale of timber or from work in the woods."

"There were beautiful stands of timber here years ago," Mr. Clashman continued, "but unfortunately we didn't realize how quickly they would disappear. In those early days our people burned regularly to keep the ground clear. Now, since the fire tower is up and we have learned to plant trees, they think differently."

Mr. Clashman explained how, as county superintendent of schools, he comes in contact with 2,400 boys and girls from six to eighteen years of age, and that he looks to them to make conservation history in the state. Helping to organize these young

people into conservation clubs to plant and protect trees and to learn the value of conserving soil and forests is only one phase of his interest, however. Last year, with the aid of the County and State Extension Service, and the cooperative farm forestry project, he interested fifty-five students in developing their own black locust seedlings to plant at home on the farm.

J. G. Zimmerman, soil conservationist assisting Mr. DeYoung, explained how farm woodland management ties in closely with the farm business and soil conservation. "Our farmers," he said, "are interested principally in growing livestock, grain, canning crops, and tobacco. But each has some woodland in need of treatment and some rough land that is eroding and should be planted to trees."

Pointing out that every acre on the farm should serve some useful purpose, he explained that the first step was to determine what the soil can grow best and still meet the farmer's needs, and at the same time be protected from erosion.

"When the slope is too steep to allow cultivation," he continued, "we work out with the farmer the use of such land for long-term meadow or pasture. On a slope that can be safely used for corn or other grain, we divide it into narrow strips following the contour. Land too steep for cultivation, pasture, or hay is planted to trees."

Woodland, he believed, was an important crop in conservation farming, but in spite of favorable soil and climate in Jefferson County, trees needed to be protected from fire and grazing damage.

"This country is famous for its white oak and yellow poplar," Mr. Zimmerman concluded, "and we have good markets for wood products. Nearby are industries manufacturing lumber, veneer, furniture, handles, baskets and other products. Also, there are a number of small sawmills operating locally. Fuelwood, posts, and logs are readily sold by farmers around here—and it means extra cash. But we believe in growing trees for another purpose, too, for use right on the farm. Every farmer needs fuelwood, and each year fence posts need replacing. Perhaps a storage shed needs to be built or a barn repaired. We don't have figures on it here, but I know that in other places farmers use as much as 2,000 feet of lumber every year for home use. Having that lumber in his woods means money in his pocket."

It is common practice for conservationists to bewail the apathy of local people toward protection and wise use of their forest and soil resources. If such a visitor to

Madison, Indiana, would talk with members of the farm forestry committee he could not help but share the enthusiasm of some of the leading farmers and businessmen for conservation. For here is an example of what people can do in their community when they are interested in the welfare of the land.

Following in Indiana's footsteps, thirty-two other states have developed cooperative programs, bringing the total number of farm forestry projects in the nation to forty-four. These are just a beginning, but the way has been opened for further progress on farm forestry problems.

Tree planting stock is becoming more readily available to farmers at lower production costs and they are learning to plant their rough and eroding land to a useful woodland crop. Methods for marketing more profitably and utilizing more completely are under trial and promise to provide a means of greater encouragement for good woodland management practices. Through united action and a cooperative approach, land owners and government agencies are looking toward the solution of problems heretofore seemingly insurmountable by individual initiative. But in the end the degree of success in this great land use program will depend largely on how more than 6,000,000 farmers respond to the need for building and maintaining a sustained woodland crop and soil protector on 185,000,000 acres of the nation's farm land. On them rests the responsibility.

Is Your Sprayer Ready for Next Year's Crop?

Condensed from American Fruit Grower

R. D. Barden

Extension Agricultural Engineer

BY far the largest number of problems with sprayers is tied up with difficulties in maintaining pressure. All spray rigs should be operated only at the pressure for which the manufacturer designed them. Since they are subject to constant wear, resulting from high pressures and corrosion due to the action of spray materials, careful checkup of valves, valve seats, plunger cups, and cylinder liners should be of first consideration in the care of the sprayer.

Following are 10 places to check when your sprayer does not come up to or maintain the pressure required. Do not readjust the pressure regulator until you have checked the following:

1. Hole in gun disc which may be worn oversize or be too large for the capacity of the outfit. Try a new disc.

2. There may be air leaks in suction line from solution tank, either from a loose hose clamp, a missing hose nut gasket, a worn or broken suction hose.

3. Check frequently the suction screen in the solution tank and occasionally clean out the tank.

4. Drain cocks not fully closed, admitting air.

5. Foreign matter may be lodged on regulator valve seat so that the valve ball is not seating properly.

6. Gaskets underneath pump valve seats or cages may be missing or defective.

7. A checkup on the valves is occasionally necessary.

8. Valve seats or valve balls in base may be worn out.

9. When the plunger shows a leak, there is usually a worn cup.

10. If pressure is uneven or hand on pressure gauge fluctuates, it would indicate an air leak or an intake or discharge valve in the base as not seating properly.

Many problems of improper sprayer operation arise from carelessness in putting up the sprayer for winter months. Many of the spray materials used are quite corrosive to metals and for that reason it is wise to flush out

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the sprayer thoroughly at the end of each day's work. This can be done by pumping fresh water through all the sprayer parts, letting it flow until the discharge from the gun comes out clear. On sprayers where it is possible to remove the suction line from the tank, this can be done easily. On sprayers where the suction line cannot be removed from the tank, it is advisable to tap onto the suction line so that fresh water may run through the sprayer and clean out all the valves and lines.

When the sprayer is stored for the winter, care should be taken to see that all parts of the sprayer are free from water. This can be done by removing all drain plugs from the lower line and from the pump. Removal of the cylinder heads in many cases will assure that all water has been drained out of the pump. Before starting the engine again, turn the pump over by hand, cranking the engine to make sure that all parts are free.

To prevent the plungers from drying out and to prevent all parts of the pump from corrosion at the end of the season, pump some oil through the sprayer. This is a good practice if all spray solution has been washed out before the oil is put through the pump. Many operators prefer to use a dormant spray oil as protection for their sprayer during the winter months. In such cases, all water pockets should be drained before the oil is put in so that no damage will result from freezing.

Each year all replacements and repairs should be made before the sprayer is put away so that it will be ready to go to work when the times comes.

Does Artificial Heat for Layers Pay?

Condensed from American Poultry Journal

C. E. Lee

VERY little scientific investigation of the effect of supplementary heat in the laying house has been reported from authoritative sources. Many articles in popular poultry magazines and farm papers have seemed to indicate the desirability of some supplementary heat during the colder months, at least in the northern states. However, very little conclusive evidence has been presented.

Facts Needed

The history of the poultry industry has so many examples of erroneous conclusions resulting from insufficient data or improperly organized experiments that it seemed to us desirable to find out the facts. Accordingly, in 1935, a series of experiments on laying hens was begun to ascertain whether or not artificial heat for layers was really profitable.

Summary of Egg Production, Income, Expenses and Net Returns Per Bird

Period 10 Months — October through July

	White Leghorns		Rhode Island Reds	
	House 2 No Heat	House 3 Heated	House 2 No Heat	House 3 Heated
Eggs	165.35	149.98	176.53	161.69
Actual average income	$3.68	$3.30	$4.08	$3.70
Lbs. mash	35.72	35.76	53.35	48.4
Mash cost	89.28c	89.67c	$1.35	$1.23
Lbs. pellets	29.4	23.16	25.18	26.1
Pellet cost	67.99c	60.66c	63.85c	66.21c
Lbs. grain	16.73	16.43	16.59	11.43
Grain cost	31.36c	30.16c	30.11c	21.03c
Litter cost	6.65c	4.16c	10.53c	10.79c
Litter labor cost	1.14c	.95c	1.36c	1.75c
Fuel cost		13.57c		13.86c
Net return	$1.72	$1.30	$1.67	$1.34

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The earlier work seemed to indicate that annual egg production both in New Hampshires and in White Leghorns was lowered by the use of supplementary heat in an insulated laying house. Whether this would be equally true in an uninsulated laying house may be open to argument, but since a house may be insulated at a lower cost, over a period of many years, than it can be satisfactorily heated, it seemed obvious that for commercial practice in the northeastern states, insulation, rather than the use of artificial heat, should be recommended.

The feed consumption was reduced about 5 lbs. per bird for the New Hampshires in the heated house and about 15 lbs. per bird for the Leghorns.

The first years of this work showed that litter cost was nearly cut in two by the use of heat and, of course, labor of changing litter was also reduced. But in later work, with different weather conditions, it was found that this saving in litter cost and labor was not uniform, and some winters there was very little difference.

With the use of coal for heat, it was necessary to consume from 25 lbs. to 35 lbs. of coal per bird per year to secure an average temperature of 45° in the heated pens.

The "net return per bird" was not significant with New Hampshires, as between the heated and unheated pens, during the first years of the experiment, but was significantly different, in favor of the unheated pens, with the White Leghorns.

It was recognized that in order to have an adequate experiment it should not only extend over several years but that adequate number of birds should be used. Therefore, eight 24 x 24 ft. pens were set aside for the experiment: 4 of these in a house supplied with artificial heat (hot water system) and 4 in a house exactly similar and standing a few feet away, without artificial heat.

Both houses were insulated with 5/8 inch standard insulation board. The houses were raised above the ground from 6 to 20 inches depending on the topography of the land, and the floors were of double matched boarding with heavy tarred building paper between. The space between the ground and the sills was closed in with matched boarding except on the south side.

Extreme care was used in selecting the stock so that all birds of a given breed included in the test each year were hatched from the same mating at the same time and reared on the same range under identical conditions. A commercial mash and grain mixture were used on the rearing

range. During the earlier years of the experiment, a commercial laying mash and grain mixture were used in all pens.

During the later years, half of the birds in each house were placed on an all mash and supplementary pellet ration made by the same manufacturer as the commercial egg mash, scratch grain, and supplementary fleshing pellet ration used on the other birds.

This not only gave an opportunity to compare the all-mash and pellet method of feeding with the mash, grain, and pellet ration, but also gave an opportunity to see whether the effect of heat was the same on the pens under the all mash method of feeding as under the mash and grain system.

In the later years of the experiment, exact record was kept of the egg weights for each breed in each house.

At that time, no evidence existed, so far as we knew, as to the exact point where increasing temperature began to decrease the metabolism of the birds and therefore the egg size and shell quality. However, long observations on laying hens both in the New York State Egg Laying Test at Farmingdale and later at the Research Farm had indicated that invariably we got a decrease in egg size and in egg shell quality with an increase in temperature, when that increase reached much above 60°. This was most noticeable in early summer when a sudden hot wave would often result in an increase in the number of soft-shelled eggs and a decrease in the average size of eggs.

We had observed that this effect was most pronounced if the birds were too fat, either from the over-feeding of corn and other grains or from a generally unbalanced ration.

In many experiments we find that income is calculated simply by crediting each group of birds with the total number of dozens of eggs at the average market price. This, of course, is an inexact and unscientific method of computation, and in our experiment the income was found by computing the actual value of the eggs laid on the basis of the sizes and number of each size, from each pen, and the net returns actually received for each particular grade in the shipment in which each lot of eggs was included. Shipment was made to New York City on Monday and Thursday of each week, and the eggs were sold at a premium of 2c to 3c per dozen over the eggs of that grade, the exact premium depending on the season of the year and the particular grade.

Temperature control in the heated house was by special Minneapolis-Honeywell thermostatic regulators, two in number,

installed so that the pens on the west end of the heated house, which were exposed to strong west winds, could be kept at exactly the same temperature as the pens on the east end. The three pens on the west end were supplied with hot water by a separate line direct from the boiler. The boiler itself was equipped with an aquastat to maintain uniform temperature of the water in the boiler at all times, and a motor circulator was provided.

Temperature readings were taken 18 inches from the floor and on an end wall in each pen.

During the later years of the experiment, an oil burner was fitted to the boiler converted with suitable lining of the firebox. Much to our astonishment the cost of fuel, which had been $120.00 to $150.00 per year for a 135 x 24 ft. house (4 pens of which were used for the experiment) was cut to $95.00 with the use of oil. Allowing for some seasonal difference, it appears that enough fuel was saved by better regulation during the fall and spring months to make up for a somewhat higher cost for the oil during the most severe period of the year.

In the heated house the thermostatic controls were set to turn on heat in these pens when the temperature dropped below 38° and to cut off heat when the temperature rose above 40°.

Occasionally, the temperature rose considerably above 40° due to heat from the sun. The thermostatic controls were very sensitive, and the temperature seldom dropped below 38°; when it did get slightly below, the regulator turned on the heat and brought it back to 38° or more within a matter of 30 minutes or less.

The house that had no artificial heat maintained fairly satisfactory inside pen temperatures, only occasionally being recorded at below freezing at noon. On one occasion, however, the temperature was down to 25° at noon, and on several other occasions there were temperatures that were below freezing. The 7.30 A.M. reading showed, in February, as low as 22° above zero inside the house, in spite of the insulation and the heat from the birds. This 7.30 A.M. reading was taken only during a short period in February when the most intense cold of the winter was experienced.

Considering the White Leghorns, we see in the Table the summary of egg production, income, expense, and net returns per bird. The birds in the unheated pens averaged 165.35 eggs per bird for the period of 10 months from October through July. The actual average income was $3.68 for the 10 months and

the expenses for each type of feed, litter, and labor cost for changing litter, are shown, and the return of $1.72 net per bird contrast with the production of 149.98 eggs per bird for the 10 months in the heated house with a net of $1.30.

It should be stated that the stock used was not selected for extreme high egg production but was selected to represent typical stock such as the average poultryman might have on his farm.

Lower Income With Heat

This table also shows the results with R. I. Reds. Here we had a production of 176.53 eggs per bird for the 10 months in the house without heat and a net return per bird of $1.67, while the Reds that received artificial heat showed 161.69 eggs per bird with a net of only $1.34 per bird.

Labor cost other than that required for changing litter was not included, as this was substantially uniform for all pens heated or unheated. The same was true of the cost for artificial light.

Here again we found, as in previous years, that the use of supplementary heat in an insulated laying house under the climatic conditions of central New York State results in a lower annual egg production, a slightly lower feed consumption, occasionally a lower litter requirement, and a serious and consistent lowering of the net flock income.

Random eggs were weighed 3 days each month, during the last 4 months of the heating period in one year. The temperature used, in general below 50° did not cause a decrease in the average egg weight as compared with the birds in the pens not receiving artificial heat. The average weight per egg for the 4 months' period for the Leghorns in the unheated house was 2.088 oz. compared with 2.053 oz. in the heated house; for the Reds, the average was 2.153 oz. in the unheated house and 2.171 oz. in the heated house.

Operators of laying cage plants may raise the question as to whether artificial heat, as commonly used in such plants, is necessary or advisable. We want to emphasize that this series of experiments does not specifically answer this question. We do believe (and this has been confirmed by research work on laying cage management extending over a period of 13 years) that birds in cages, because of the fact that they get less exercise and are exposed to moving air on all sides to a much greater extent than layers on the floor in a well insulated house, do probably have a somewhat higher heat requirement.

As a matter of fact, our investigations have shown best results

with hens in laying cages where a temperature of about 45° is maintained during the season when artificial heat is needed, that temperatures above 50° are likely to result in more or less periodic molting alternating with periods of very high production. In England where the climate is much milder, excellent results are obtained without artificial heat in cage plants but in this country, at least in the north, we have the problem of freezing water pipes to consider as well as the effect on the birds themselves; therefore we do recommend enough heat to keep the temperature about 45° and not over 50° during the period when artificial heat is required.

It appears that we have to strike something of a balance between the effect of heat on egg size and the necessity to conserve heat when we try to set an ideal temperature. Further, we know that a lower temperature means that the bird must consume an increased amount of feed in order to keep her body temperature up to normal. Our experience indicates that around 45° to 50° approaches the ideal, all things considered, for winter conditions where artificial heat has to be provided, or where it is possible to maintain the desired temperature by proper insulation of buildings to conserve the heat produced by the birds.

It is obvious that it would be a great advantage to be able to air-condition the laying house in the summer so that temperatures could be held down to a lower level during periods of extreme heat. Thus far, it seems that about the only practical way to do this is by the use of highly effective insulation in the house and a good ventilation system.

Sooner or later it is probable that air-conditioning outfits will be available for poultry laying houses at prices poultrymen can afford to pay, but that time has not yet arrived, though we do have cases where cool water is available which can be circulated through units used for heating in winter and which will appreciably cool the air of the laying house in summer. These units are of the automobile radiator type with a fan mounted behind them for air circulation. Where cool spring water is available, the use of such units in laying houses and particularly in large laying cage plants seems to be entirely practical.

Keeping Pipes from Freezing

Condensed from Electricity on the Farm

J. B. Stere

West Penn Power Co., Pittsburgh, Pa.

AUTOMATICALLY controlled running water is perhaps the most important labor-saving device in a poultry house. Yet when the temperature drops below freezing it has sometimes been necessary to turn off this labor saver and return to bucket carrying. Three years ago several Pennsylvania poultrymen, in co-operation with the writer, set out to find a freeze protection for water pipes. Their experience proved that with soil heating cable, an inexpensive thermostat, a little sheet of asbestos in some cases, and a roll of friction tape, they could get the desired results, and with low initial and operating costs. It is still recommended, where possible, to bury pipes below frost level for protection.

For sections of exposed pipe up to 4 feet in length a light bulb was found to be a satisfactory heating element. A wooden box was constructed just large enough to enclose the exposed pipe and the light bulb. By placing the light bulb near the lowest part of the box the heated air will rise and give satisfactory protection. Insulation, other than the wooden box itself, is seldom necessary. when the room temperature drops to the freezing point, the light bulb is turned on and permitted to burn throughout the cold period. These installations can be made at a cost of about 45 cents for extension cord, socket and lamp, and around 30 kw.-hrs. will operate it for a winter season.

In poultry houses where there are continuous long sections of exposed pipe, either lead or rubber covered soil heating cables were found to be satisfactory heating elements. The lead covered cable is rated at 400 watts for 60 feet on 115 volts, and the rubber covered at 200 watts for 60 feet on 115 volts. Either of these cables can be secured in 120-foot lengths for 230 volt operation. In this case the wattage will be double that of the 60-foot cables.

A 60-foot section of lead cable will protect 60 feet of one-half inch pipe under average weather conditions found in Pennsylvania. (This is 6⅔ watts per foot of pipe.) In some of the northern counties where the

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temperature falls to 20° below zero, 60 feet of cable is spiraled around 40 feet of pipe to give 10 watts per foot. The shortest length of pipe that will accommodate 60 feet of cable is approximately 20 feet. In all cases, wrap the cable around the pipe in such a manner that it does not cross.

To obtain 6⅔ watts per foot of pipe, 60 feet of rubber cable will protect 30 feet of pipe while the same length of cable spiraled around 20 feet of pipe will provide 10 watts per foot. The minimum length of one-half-inch pipe on which 60 feet of this cable can be placed is approximately 9 feet.

Only where the pipe is exposed to the weather or direct drafts is it necessary to insulate. The practice then is to wrap two layers of sheet asbestos paper about the pipe. A roll of asbestos paper 18 inches wide, 20 yards long, weighing 10 pounds, will cover over 100 feet of pipe. If additional insulation is desired, wrap several layers of old sacks around the asbestos. The insulation within reach of the birds should be painted with tar or aluminum paint. Protect the insulation from moisture.

The thermostat is placed in the coldest section of the room against the pipe. The same amount of heat and insulation is provided over the thermostat and pipe as is provided for the rest of the pipe. The thermostat should be adjusted to turn on at about 33° F. The temperature at which it turns off will be governed by sensitiveness of the thermostat used. With different thermostats this varies from one to four degrees.

When there are a number of short sections of pipe in one building, the soil heating cable is cut in lengths in proportion to the sections of pipe so that the entire 60 feet is used. These sections are connected in series with No. 14 copper wire. Never use less than 60 feet of cable on 115 volts or less than 120 feet on 230 volts.

Mr. L. C. Bunce, near Butler, Pa., protected eight fountains in the winter of 1939-40 served by 45 feet of pipe for 193 kw.-hr. No insulation was used.

Mr. J. E. Durst, near Uniontown, Pa., protected 80 feet of pipe in his poultry house for 162 kw.-hr. during the winter of 1940-41. The pipe was insulated.

Floyd E. Bennett, near Canonsburg, Pa., used two 60-foot sections of rubber-covered cable and no insulation to protect 50 feet of pipe in his house, 25 kw.-hr. were used in the winter of 1940-41.

Over 30 poultrymen in western and central Pennsylvania are using this worry-free and labor-saving method of keeping water running.

Nutritive Requirements of Poultry

Condensed from New England Poultryman

Harry W. Titus

Senior Biological Chemist, Bureau of Animal Industry

EVEN though the feed-egg ratio has been decidedly favorable to the producer since last April and is likely to remain so for some time to come, there is a pressing need for us to have the fullest possible knowledge of the nutritive requirements of poultry. The reason is obvious. Our stores of most of the feedstuffs used in feeding poultry are more than adequate, but we do not have enough of some of the feedstuffs on which we have learned to depend as sources of high-quality protein and some of the vitamins.

The combined supplies of corn, oats, barley and grain sorghums for this coming year are slightly larger than those with which we entered last year and about 17 percent larger than the 1928-32 average supply. The supplies of wheat millfeeds should be above the average for recent years and the supplies of certain high-protein feedstuffs should be the largest on record. But more and more dried skim milk and dried buttermilk will be used as *human food* in the months ahead of us, and, hence, there is a very good likelihood that there will be too little of these two feedstuffs to supply the demand for them. Moreover, our importations of cod-liver oil, other vitamin-bearing fish oils, and vitamin concentrates obtained from fish oils have been reduced to almost negligible quantities, and so we shall have to turn to other sources for our vitamin D and vitamin A.

We are fortunate in that the poultry nutrition research of the last 15 to 20 years has supplied us with valuable information about the nutritive requirements of poultry and the nutritive properties of many of the feed-stuffs that commonly are used in feeding poultry. Much of this information was summarized in the 1939 Yearbook of Agriculture and now is available in Yearbook Separate 1714, "Practical Nutritive Requirements of Poultry," free copies of which may be obtained by writing to the Office of Information, U. S. Department of Agriculture, Washington, D. C. The following table, which is re-

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printed from page 818 of the 1939 Yearbook of Agriculture, summarizes briefly some of the nutritive requirements of poultry.

At the present time our greatest concern is with the problems of finding suitable substitutes for dried skim milk and of supplying adequate quantities of vitamins A, D, and G.

No complete substitute for milk has been found as yet, but it is possible to devise substitutes that are almost as good and often much cheaper. Any substitute for milk that is worth considering must supply in sufficient quantity: (1) protein of high quality, (2) vitamin G (or riboflavin), and (3) pantothenic acid.

As sources of high-quality protein in formulating substitutes for dried skim milk, we can use fish meal and meat scrap, but preferably the former. As sources of vitamin G and pantothenic acid, we can use alfalfa leaf meal, certain special by-products of the fermentation industries, dried corn distillers' solubles, and dried whey. Dried whey deserves special consideration, so long as its price is not too high, because it is also a source of protein of very good quality.

An excellent substitute for dried skim milk or dried butter-

Requirements of Different Classes of Chickens and Turkeys for Protein, Minerals and Vitamins for Satisfactory Growth and Development under Various Conditions Observed in Practice

Class	Protein*	Phosphorus	Calcium	Manganese in total feed	Vitamin A†	Vitamin B	Vitamin D	Vitamin G (riboflavin)
	as proportion of total feed			per pound of total feed				
	Percent	Percent	Percent	Parts per million	International Units	International Units	A.O.A.C. Chick Units	Micrograms
CHICKENS								
Growing chicks	21	0.7	1.1	50	1,450	180	180	1,670
Laying stock	16	1.0	2.4	50	3,150	180	360	630
Breeding stock	16	1.0	2.4	50	4,720	180	540	1,250
TURKEYS								
Growing poults	25	1.0	1.6	50	3,630	180	360	1,670
Breeding stock	16	1.0	2.4	50	4,720	180	540	1,250

*The protein must be of reasonably good quality; and it is desirable that not less than 20 per cent be derived from animal sources.

†If the feed is to be stored for more than a month before it is fed, not less than 70 per cent of the vitamin A should be derived from plant sources.

milk is a mixture of 6 parts, by weight, of fish meal and 4 parts of one of the fermentation by-products that contains about 27,000 micrograms of riboflavin (vitamin G) per pound and has a high content of pantothenic acid. Another very good substitute may be made by mixing 1 part each of alfalfa leaf meal, dried whey, and one of the better fermentation by-products with 2 parts of fish meal.

At the present time our best source of vitamin A, from the standpoint of cost, appears to be alfalfa leaf meal. The better grades—those that contain at least 120,000 International Units of vitamin-A activity, or 72,000 micrograms of carotene, per pound—are to be preferred, but alfalfa leaf meal that contains only 60,000 International Units of vitamin-A activity per pound will be satisfactory.

The currently available sources of vitamin D include sardine oil, fortified sardine oil, various blends of fish oils (known commercially as vitamin-A-and-D feeding oils), and "D"-activated animal sterol. The last-named product, which sometimes is called "dry D," is to be recommended because of its comparatively low cost.

The best sources of vitamin G include certain special fermentation by-products, liver meal, dried skim milk, dried buttermilk, dried whey, dried distillers' solubles, alfalfa leaf meal, dried distillers' grains with solubles, and dried distillers' grains. Inasmuch as dried skim milk and dried buttermilk are not likely to be available in sufficient quantity, we probably shall have to make more extensive use of the other sources. Those that deserve special consideration are alfalfa leaf meal and the special fermentation by-products, some of which contain 2 to 3 times as much vitamin G as dried skim milk or dried buttermilk.

In feeding for maximum production careful thought should be given to the matter of supplying sufficient protein of high quality. For growing chickens of *all ages* the diet should contain not less than 18 percent and not more than 22 percent of protein, of which at least one-fifth should be derived from animal sources. For laying stock 16 per cent of protein is adequate under most conditions, especially if about one-fifth comes from animal sources. If, after the required quantity of animal protein has been included in the feed mixture, more protein is needed to bring the total protein content to the desired level, soybean meal may be used with distinct advantage.

Grass Is Money

Condensed from New Jersey Farm and Garden

THE development of an adequate pasture and grassland program undoubtedly offers one of the most outstanding opportunities in agriculture.

Many pastures are so depleted in soil fertility that little desirable herbage is grown. The result is that dairy cattle fail to produce sufficient quantities of milk, due both to the unpalatableness of the vegetation and to the amount of energy expended in harvesting this limited supply.

Pasture improvement offers one of the surest and most effective ways to reduce the cost of producing milk. There is no cheaper way to obtain digestible nutrients with high mineral, protein and vitamin contents than by adequate pasture fertilization and good management.

There is no cheaper way to harvest a crop than to send the dairy cow out after this feed. It reduces the labor cost to the absolute minimum and puts the nutrients into the livestock cycle at the lowest possible expense.

In selecting a pasture area to be improved, take the best part of the pasture, with deep soil that will hold moisture and already has a fair stand of suitable grasses. It's better to use a small amount of the pasture land and concentrate on its improvement than to spread a small investment over such a large area that the results are very small.

Before spending money for pasture improvement, it is a wise thing to take soil samples to the experiment station or county agent and have them analyzed.

"Pasture is the best cash crop that the dairyman has at his disposal and rotation management of permanent pastures can produce all of the succulent roughage necessary to carry a milking herd for the entire pasture season of 150 to 180 days on the heavier soil types in the Northeast." We have this on the authority of C. B. Bender, professor of dairy husbandry at the New Jersey State College.

To accomplish the above, Prof. Bender makes the following suggestion for a pasture program:

1. Set aside a total pasture acreage equivalent to one acre per cow.

2. Divide this area into six pasture fields of equal size by electric fence.

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3. Lime the pasture to raise the pH to 6.0 or above and add superphosphate. Use nitrogen either alone or in a complete fertilizer mixture to stimulate a different pasture plot each year for early pasture. Use eight to ten tons of manure per acre each year on two plots. Rotate these applications each fall and harvest the first growth from these fields each year for grass silage and pasture the subsequent growth.

By following this system of pasture management, sufficient succulent feed for the milking herd in most seasons will be assured. Each pasture field should be mowed after the cattle have grazed it and the clipped material left on the field until the cattle are returned to the plot. This procedure reduces the weed population, or if needed, the cuttings may be made into hay.

Fertilizer should be applied in amounts determined by the soil needs and the climatic conditions of the region.

Prof. Bender, in continuing his discussion of pasture problems, says: "After the acidity of the soil is corrected, we apply 250 pounds of superphosphate to two different fields each fall. On many of our soil types, the manure seems to meet the needs of the plants for potash, but on other soil types an added economical response is derived from applications of 100 pounds of muriate of potash per acre every three years.

"The use of nitrogen to stimulate early pasture or medium early grazing on one or two plots is usually a sound practice. The silage produced from the manured areas averages about four tons per acre. Also a sound practice, when two fields are mowed for this purpose, is to mow one field close and the other at a height of four inches. This four-inch growth can be grazed at any time and does not seem to be unpalatable.

"Fall applications of the fertilizers and manure are good practices on the heavier soil types. On these same soil types we frequently apply the nitrogen fertilizer to the plot that is to be grazed early in spring if calcium cyanamid or sulfate of ammonia are to be used. For general pasture improvement of other than rotation pastures, fall applications of 500 pounds per acre of 0-10-10 mixture are recommended for ladino stands and 500 pounds of a 5-10-10 mixture for permanent pastures.

Keeps Mineral Balance

Proper fertilization of the pastures will prevent mineral starvation among cattle. While calcium and phosphorus are more apt to be deficient than most of the other plant foods, there is a long list of vital elements most of which can best be furnished to the animals in organic forms as

constituents of well-fertilized pasturage or crops. Fertilization also increases the protein content of the herbage and makes the feed of greater value."

Building up pastures is of little value unless the proper management in grazing them is observed. Graze the pastures to capacity whenever growth justifies but not too soon or too severely on new seedings. Electric fences are an economical and effective means of control. Surplus growth or surplus areas may be used for hay or silage. One-half to one acre per animal unit, depending upon the productivity of the soil and the season, will be required in the early part of the season, and one to two acres in July and August.

The depletion of soil fertility is the main cause of pasture deterioration, so it is easy to see why plant food must be used to restore former productiveness.

Six Reasons

There are six important reasons why pastures should be fertilized.

1. Provides one to two weeks' earlier grazing in the spring . . . saving barn feeding.

2. Increases the total yield of herbage . . . requiring fewer acres of pasture per cow.

3. Prolongs the grazing season.

4. Increases the protein content, thus reducing the cost and amount of feed that must be bought.

5. Increases the mineral content of the grass, insuring the stock against mineral deficiency diseases.

6. Produces more milk and beef at lower cost, resulting in larger profits.

All dairymen interested in larger profits (and who is not?) can take advantage of this method of producing more milk at lower feed and labor costs.

The Value of a Good Sire

Condensed from The Cattleman

Dr. C. W. McCampbell

Head, Department of Animal Husbandry, Kansas State College

ANYONE who has achieved any measure of success in the production of livestock recognizes the value of a good sire, but unfortunately the rank and file of livestock producers do not seem to recognize this value. The situation is the same in the production of commercial as well as purebred livestock, and in this connection I would like to relate an incident typical of thousands that really emphasize the value of a good sire. Not so long ago a farmer bred a group of average farm mares three successive years to a grade stallion that was generally considered a pretty good individual. However, this particular farmer was not satisfied with the kind of colts he was producing and since the service of a really good stallion was not conveniently available, he purchased a good registered Percheron.

When the first crop of colts by this good purebred stallion had reached weaning age this farmer found it necessary to hold a public sale and quit the farm. The three-year-olds, two-year-olds, and yearlings all sired by what was considered a good grade stallion brought an average of $76, $55, an $37 per head respectively. The weanlings sired by the good purebred stallion brought an average of $101 per head. It should be emphasized that each age group was out of the same mares and that the weanlings sired by the good purebred stallion brought $25 per head more than the three-year-olds sired by the grade stallion—a practical illustration of the value of a good purebred sire.

The characteristics or qualifications of a good Percheron sire are many. I would particularly emphasize proper size, correct type, a lot of substance, an abundance of quality, plenty of constitution, outstanding character, easy action, good feet and legs and freedom from hereditary unsoundness. The question of size in Percherons is being discussed considerably at the present time. It is my opinion that we do not need as much size in purebred Percherons today as formerly but it would not be practical to re-

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duce the size of purebred Percherons to the most desirable size for work horses for the reason that nature and environment are constantly tending to reduce size in our draft horses. This being true it would seem that the most practical size for our purebred Percherons would be around 200 pounds heavier than the most practical size for work horses—both in the same flesh.

It is also my opinion that this problem of size in Percherons will never be solved until definite action is taken officially as to the maximum size acceptable and eligible for rating in the show ring. The need of such action is emphasized by the fact that during recent years while much has been said in favor of smaller Percherons some of our champions have been the largest in the history of our show. Possibly the best first step would be to set a maximum height and get weight through compactness, but I would warn against developing Percherons that are too "pudgy," short-legged, and big-bellied if we expect them to do a full day's work during the heat of midsummer. Let's either drop size discussion or do something definite about it.

Type to me means pattern. It also implies a particular pattern for a particular job; for instance, the compact draft type for power and the angular roadster type for speed. Uniformity of type in a breed is most desirable.

Durability, a most important qualification of a good draft horse depends upon three factors. One is substance which is indicated in the main by quantity of bone; another is quality which in the main is indicated by refinement of fibre of bone. Some try to tell us that these two characteristics are opposites and cannot be combined in the same individual. However, such is not the case. It is much easier to secure either than both in the same individual but a combination of both can be secured in the same individual by careful selection and proper breeding methods. The third factor determining durability is constitution which is indicated by well sprung ribs and a deep chest.

Character is somewhat difficult to describe or define but to me Marshall's discussion just about tells the story. He says, "Character or strong individualism is contributed to by three things—(1) style, (2) high development of the appearances associated with sex, and (3) robustness and vigor of expression read in the countenance, particularly the eyes, and also reflected in boldness of movement."

Good action implies the least possible expenditure of energy in moving. Such action is characterized by straight, elastic, snappy

movement of feet and legs. Good feet and well-set legs in addition to being important factors in good action determine to a very large extent the ultimate usefulness of a horse.

In addition to all the requirements mentioned a good sire must be free from hereditary unsoundness.

Does it pay to patronize stallions with pedigrees representing popular blood lines? This question cannot be answered with a simple yes or no. Naturally, popular breeding carries considerable prestige. However, it must be remembered that the best of families in all classes of livestock, produce an appreciable number of ordinary and even inferior individuals. Ordinary or inferior individuals with aristocratic family trees should be shunned as a pestilence for so they usually prove to be when used for breeding purposes. The harm ordinary and poor individuals do lives after them often for many generations. Many breeds have suffered greatly from over-emphasis on blood lines and under-emphasis of good individuality. Good breeding combined with good individuality is the combination upon which progress in livestock breeding depends.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

Breeding Your Own, or Raising Colts for Pleasure and Profit—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Conservation in the United States—By Gustafson, Ries, Guise and Hamilton. Comstock Pub. Co. $3.00.
(See Farmers Digest, July, 1940)

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

Electricity in the Home and on the Farm, by Forrest B. Wright ($2.75). Published by John Wiley and Sons, Inc.
(See Farmers Digest, November, 1941)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

Forestry in Farm Management—By R. H. Westveld, and Ralph H. Peck, John Wiley and Sons, Inc. $3.00.
(See Farmers Digest, September 1941)

Fruit Crops—By T. J. Talbert, Prof. of Horticulture, Univ. Mo., and A. E. Murneek, Asst. Prof. Horticulture, Univ. Mo. Lea and Febiger. $3.75.
(See Farmers Digest, June, 1941)

Hunger Signs in Crops—Published by the American Society of Agronomy and The National Fertilizer Review. $2.50.
(See Farmers Digest, October, 1941)

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.
(See Farmers Digest, January, 1941)

Livestock and Poultry Diseases—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.
(See Farmers Digest, February, 1941)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

Poisonous Plants of the United States—By Walter Conrad Muenscher, Prof. Botany, Cornell. Macmillan Company. $3.50.
(See Farmers Digest, November, 1940)

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $4.00.
(See Farmers Digest, November, 1941)

Plant Ecology—By W. B. McDougall, Regional Biologist, Santa Fe, New Mexico. Lea and Febiger. $3.00.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.
(See Farmers Digest, December, 1940)

The Nutgrowers Handbook—By Carroll D. Bush (Orange Judd Publishing Co.). $1.75.
(See Farmers Digest, January, 1942)

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw-Hill Book Co. $5.00.
(See Farmers Digest, May, 1940)

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.
(See Farmers Digest, March, 1941)

For the convenience of our readers, books listed may be purchased through this Department. Address C. Leavitt Dyer, Farmers Digest, Ambler, Pa.

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